CHART PROGRAM

ATMS RELEASE 18

SYSTEM DESIGN DOCUMENT

Version 1.0
Work Order 10 Deliverable 3
Doc# WO10-ATMS-RD-002

Date: June 15, 2017

Prepared by: CSRA

Approved via separate Deliverable Acceptance Form per RFP section 3.9.2

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Revision History

Date	Version	Description	Author
June 26, 2017	1.00	Initial release	ATMS Team

1 INTRODUCTION

1.1 Purpose and Scope

1.1.1 Purpose

This document describes the design of the software for CHART ATMS Release 18. The CHART ATMS R18 release provides the features listed below. These features are being developed under work order WO 10.

- **Flash Application Replacement**: Most modern web browsers stopped supporting Flash content and there are some security concerns using Flash. The ATMS GUI application uses the Flex framework to develop UI components, which requires the Flash browser plug-in at runtime to render and display the application components. Because of above-mentioned concerns, Flex and Flash components in ATMS application will be replaced with HTML5 where possible. There are four custom Flex / Flash applications currently used in the ATMS GUI, plus JWPlayer (a third-party library which uses Flash). These are listed below:
    - **Home Page App:** This Flex application handles the Events, Resources, and Alerts tabs of the Home Page. (It is shown under the buttons at the top of the Home Page, but does not include the buttons themselves, which are JavaScript but interact with the Home Page app to switch between the different views). The following use cases comprise this feature:
        - ATMS-2377: Flash - Home Page - Event Lists - Display Event Lists
        - ATMS-2378: Flash - Home Page - Event Lists - Set Interesting Flag
        - ATMS-2379: Flash - Home Page - Event Lists - Sort List
        - ATMS-2380: Flash - Home Page - Event Resources - Display event resource Lists
        - ATMS-2381: Flash - Home Page - Event Resources - Set in-out Of Service
        - ATMS-2382: Flash - Home Page - Event Resources - Select contact, Patrol areas putting Field Unit in service
        - ATMS-2383: Flash - Home Page - Event Resources - Sort event Resource Lists
        - ATMS-2384: Flash - Home Page - Alerts - Display Alert Lists
        - ATMS-2385: Flash - Home Page - Alerts - Play audio cue
        - ATMS-2386: Flash - Home Page - Alerts - Perform all alert actions
        - ATMS-2387: Flash - Home Page - Alerts - Create Generic Alert
        - ATMS-2388: Flash - Home Page - Alerts - Sort Alert Lists
    - **Edit Location App**: This Flex application is a form for entering location information for an object. It is used to specify the location for all new and existing objects. It is also used on the Create Events tab of the Home Page, in the

area to the left of the Create Events map. This form interacts with the Specify Location map (which is JavaScript). The following use cases comprise this feature:

- ATMS-2391: Flash - Edit Location - ObjectLocation and form JavaScript data models
- ATMS-2392: Flash – Edit Location – Initialize Edit Location Form
- ATMS-2393: Flash – Edit Location – Select Alias / Show All Aliases Checkbox
- ATMS-2394: Flash – Edit Location – Select State
- ATMS-2395: Flash – Edit Location – Select County / Region
- ATMS-2396: Flash – Edit Location – Select Main Route Type
- ATMS-2397: Flash – Edit Location – Specify Main Route
- ATMS-2398: Flash – Edit Location – Set Show Name checkbox for Main Route
- ATMS-2399: Flash – Edit Location – Select Direction / Proximity
- ATMS-2400: Flash – Edit Location – Select Intersecting Feature Type
- ATMS-2401: Flash – Edit Location – Specify Intersecting Route
- ATMS-2402: Flash – Edit Location – Set Show Name checkbox for Intersecting Route
- ATMS-2403: Flash – Edit Location – Specify Intersecting Exit
- ATMS-2404: Flash – Edit Location – Specify Intersecting Milepost
- ATMS-2405: Flash – Edit Location – Location Description
- ATMS-2406: Flash – Edit Location – Interaction With Map

- **Event Launcher App**: This Flex application is used on the Create Events tab of the Home Page, below the Create Events map. It contains the Source Type and other event-specific fields, the event creation buttons, and the Potential Duplicate Events list. It can also be invoked from the Comm Log (by selecting comm log entries before creating the event), and from the Pending Event List when creating a new Pending Event. It interacts with the Edit Location App.
  - ATMS-2389: Flash - Event Launcher Flex App - Potential duplicate Event List
  - ATMS-2390: Flash - Event Launcher Flex App - Create Event
  - ATMS-2412: Flash - Event Launcher Flex App - display -Update Event Launcher Form
- **Audio Recorder App**: This Flex application is used exclusively by the HAR Editor form, and allows the user to record custom voice messages using the computer's microphone. This application is conditionally shown; it is only shown if the user has clicked on the "switch to audio recorder version" link in the HAR Editor. The alternative form allows the user to upload audio files created with an external recording application. In R18, the Audio Recorder application and option will be removed entirely. The following use case comprises this feature:

        - ATMS-2611: Remove Audio Recorder

      In addition to removing the option from the HAR Editor page, the setting to display the Audio Recorder stored in the User Profile will be removed as well.

    - **JWPlayer**: JWPlayer is used for the "desktop video" feature, to display streaming video for cameras in the ATMS system. JWPlayer is a third party COTS application. JWPlayer at a high level is an HTML5 / JavaScript application, but under the covers, it uses one of two rendering engines: either HTML5 or Flash. CHART ATMS currently uses RTMP streaming from its Streaming Flash Server (SFS) implementation. RTMP is Flash-specific and JWPlayer requires its Flash implementation to play this protocol. If CHART ATMS were changed to stream an HTML5-compatible protocol, JWPlayer could use HTML5 rendering, but for R18 that is not possible, so JWPlayer will continue to rely on Flash.

- **Other WO 10 PRs:** Several problem reports are addressed in this release. Following is a list of these PRs, with their identifying number and a short description:

  ATMS-839: DataExporter attempts to send more than the max allowable lanes in a traffic event:

  The DataExporter service will be configured to support exporting a maximum allowable of 64 lanes in a traffic event instead of 32 lanes. This will avoid failure of the entire DataExporter message, which leads to losing other traffic events in the message.

  ATMS-887: NTCIP DMS: Consider Skipping FontStatus Check on Per DMS Basis:
  When an NTCIP DMS is place online, the font is checked on the DMS to make sure it matches what the ATMS thinks the font should be. If the font does not match, it is uploaded to the sign. While doing this, a flag called fontStatus is used as a synchronization mechanism, to make sure that two central stations are not updating font information on the DMS at the same time. Some DMSs do not support the fontStatus element. The fix for this PR will bypass the use of fontStatus to synchronize access to font management on these DMSs. Other DMSs completely do not support font management. There will also be an option to bypass font management completely for these DMSs. The ATMS will just have to assume that the DMS is configured in real life the way it is configured within the ATMS. Each DMS will be configurable, as to whether it processes fonts normally, bypasses fontStatus, or bypasses font management entirely. When retrieving a font from a DMS for use in a DMS Display Configuration, bypassing fontStatus will also be an option there. The NTCIP DMS Protocol Conformance Tester will support only processing fonts normally.

  ATMS-2200: Duplicate Activations Sent to LCP:

  The system will be configured to disable the Activate, Deactivate, Queue, and De Queue links/buttons after clicking the link/button. This will be helpful to prevent sending duplicate actions to the LCP and also solves the archiving problem in LCP.

  ATMS-2281: NTCIP DMS Does Not Get Set to Hardware Failed:

The ATMS has always retrieved a field called ShortErrorStatus from NTCIP DMSs, but it has never used those flags to set or clear the Hardware Failure status of NTCIP DMSs (nor made those flags visible to users in any way at all). This PR fix will force NTCIP DMSs into or out of Hardware Failure Status based on the values of the ShortErrorStatus flags. The flag values will also appear on DMS Details Pages and optionally on the DMS List Page (sortable and filterable).

ATMS-2523: Incorporate Skyline/Turnkey RVDS-based Decoder into ATMS:

ATMS R18 will incorporate Skyline/Turnkey Remote Video Display Solution (RVDS) video streaming. The Turnkey RVDS incorporates a central Video Streamer Service with many instances of a small Video Streaming Device (VSD) that can accept and display a video stream. A VSD, connected to an HDMI monitor, registers with the VSS, then waits for play and stop commands from the VSS. The ATMS will make requests to the VSS which in turn commands the requested VSD to play a specified stream (or stop streaming). These will be deployed in remote CHART ATMS locations, such as Maryland State Police Barracks, which will eliminate the need for a CHART ATMS workstation and an extension of the MDOT/CHART network out to the location to support the workstation.

ATMS-2601: Don't set DMS fontCharSpacing/fontLineSpacing when not applicable:

Some NTCIP DMSs do not accept setting fontCharSpacing and fonLineSpacing on signs where these settings are not relevant (even though the NTCIP specification says they should accept and ignore it). This fix will make it so the DMS fontCharSpacing and fontLineSpacing will not be set for a Character Matrix sign, and fontLineSpacing will not be set for a Line Matrix Sign.

ATMS-2751: Upgrade JWPlayer to 7.10.2:

JWPlayer will be upgraded to version 7.10.2.

1.1.2 Scope

The main objective of this detailed design document is to provide software developers with a framework in which to implement the requirements identified in the CHART ATMS R18 Requirements document. A matrix mapping requirements to the design is presented in Appendix A (Mapping to Requirements).

1.2 Project Executive Summary

The main objective of this detailed design document is to provide software developers with a framework in which to implement the requirements identified in the CHART ATMS R18 Requirements document. The overall contents of ATMS Release 18 are summarized in Section 1.1.1.

1.2.1 Design Process

The design was created by capturing the requirements of the system in UML Use Case diagrams. Class diagrams were generated showing the high-level objects that address the Use Cases. Sequence diagrams were generated to show how each piece of major functionality will be achieved. This process was iterative in nature – the creation of sequence diagrams sometimes caused re-engineering of the class diagrams and vice versa. This release focused on re-implementing existing capabilities using a new technology so very few design artifacts were necessary.

1.2.2 Design Tools

The work products contained within this design were extracted from the Enterprise Architect design tool. Within this tool, the design is contained in the project named "chartdesign" in the folder named "CHART-ATMS-R18".

1.2.3 Work Products

The final CHART ATMS Release 18 design consists of the following work products:

- Human-Machine Interface section which provides descriptions of the screens that are changing or being added in order to allow the user to perform the described uses.
- UML Class diagrams, showing the software objects which allow the system to accommodate the uses of the system described in the Use Case diagrams
- UML Sequence diagrams showing how the classes interact to accomplish major functions of the system

Requirement Verification Traceability Matrix that shows how this design meets the documented requirements and use-cases for this feature

1.2.4 System Overview

The CHART ATMS is a set of software programs used to identify and track traffic flow disruptions, send responders to correct the disruption and notify the public using Dynamic Message Signs (DMSs) and Highway Advisory Radios (HARs), and send notifications to the media and feeding data to a live traffic website (http://www.traffic.maryland.gov) and Maryland 511. The system runs on a combination of Windows 2008 Servers, connected to a statewide network of Closed Circuit Television (CCTV) cameras, overhead and portable DMSs, HARs, Traffic Sensor Systems (TSSs) (microwave traffic flow detectors), remote weather stations, and On/Off devices (electronic relay devices such as for horns and fog beacons). It is. The software is built using Java and C++ and connects to a Microsoft SQL Server database. Interprocess communications are achieved using an industry standard CORBA (Common Object Request Broker Architecture) package and web services (typically Extensible Markup Language (XML) over Hyper Text Transfer Protocol (HTTP)). A web-based Graphical User Interface (GUI) is connected to the CHART ATMS services using CORBA listeners and provides full CHART ATMS functionality to authorized users over a browser. The system provides data to interested parties via multiple systems both inside and outside the CHART Program umbrella, including

CHART's own CHARTWeb public website and the CHART Mapping Intranet Map (both part of CHART), Maryland 511 (MD511) (not part of CHART but falls under the purview of the State Highway Administration (SHA)), and the Regional Integrated Transportation Information System (RITIS) at the University of Maryland (largely independent of SHA). This data is provided by means of two data exporter services (one internal, one external). The CHART Program provides data which is originally created via the CHART ATMS through a secure connection to the MDOT network, by providing a secure Geographic Information System export and by providing Really Simple Syndication (RSS) XML feeds on the internet. CHART ATMS and the CHART Program as a whole provide video by transcoding the statewide video and feeding it in multiple video formats through the MDOT internal network, the Statewide Government Intranet (SwGI) and the internet.

Figure 1-1 provides an overall CHART systems architecture. Figure 1-2 provides an overall CHART ATMS architecture.

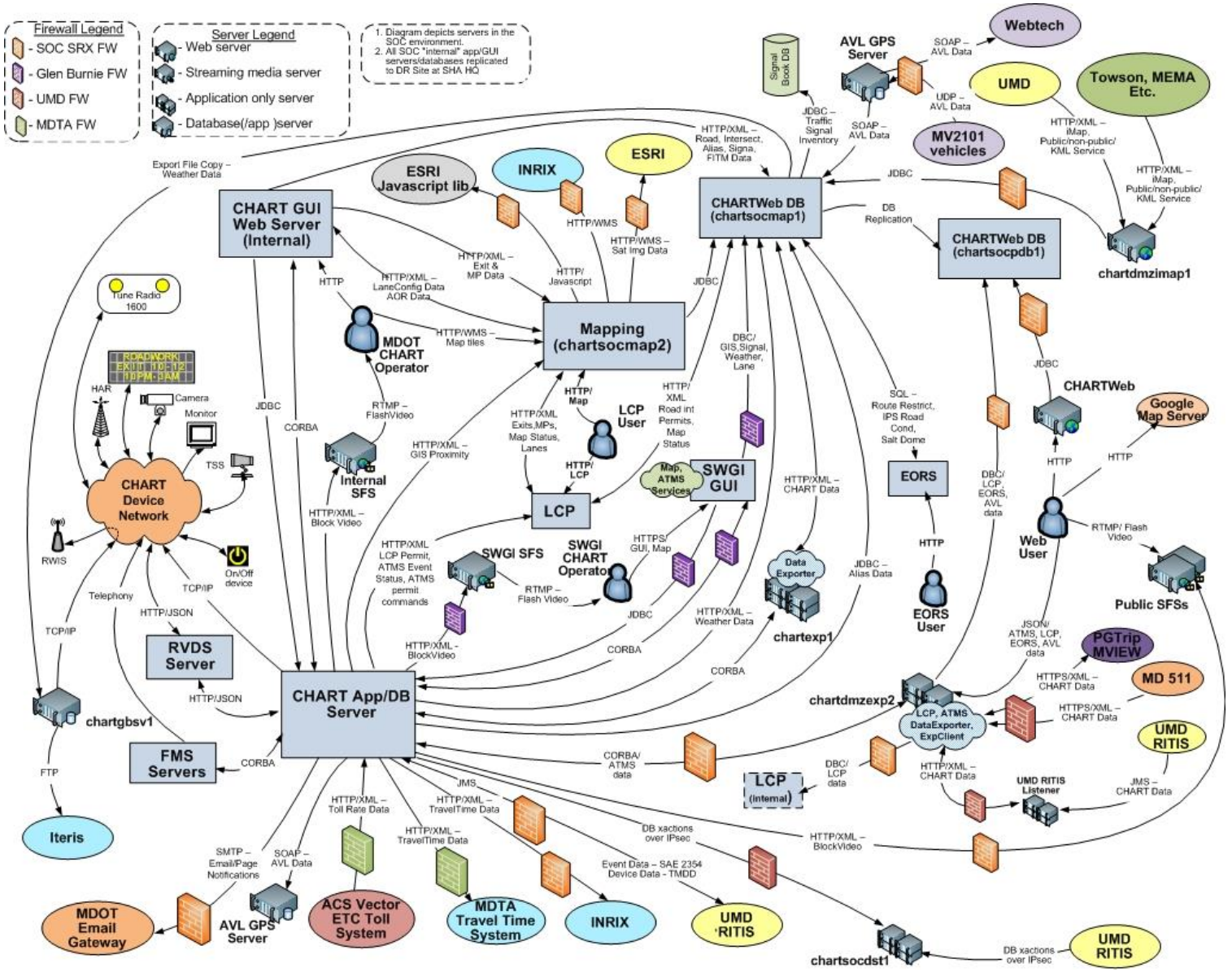


Figure 1-1. CHART and External Interfaces

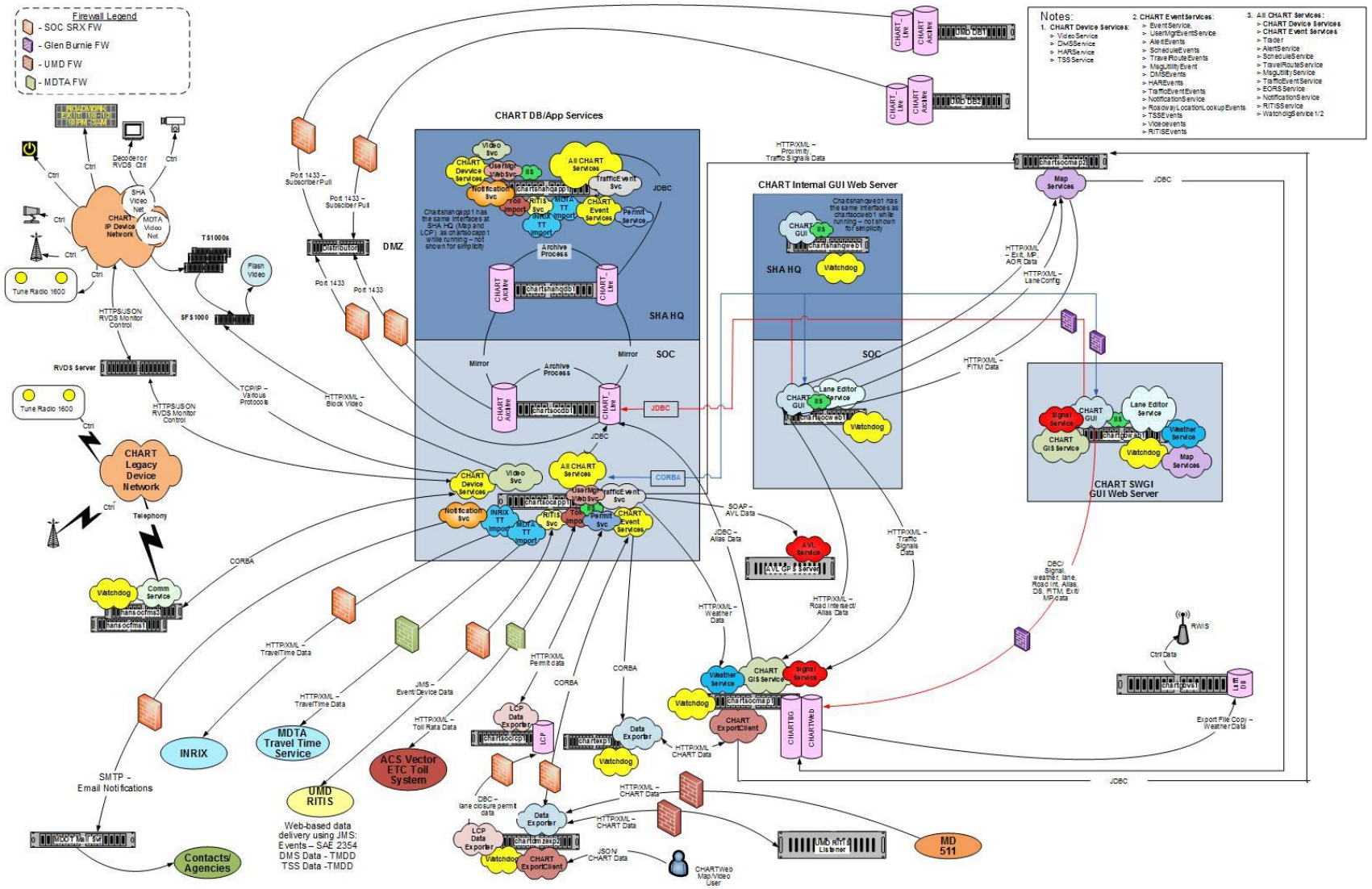


Figure 1-2. ATMS Detailed Architecture

A matrix mapping requirements to the design is presented in Appendix A (Mapping to Requirements).

1.2.5 Design Constraints

No design constraints have been identified for R18.

1.2.6 Future Contingencies

No future contingencies have been identified for R18.

1.3 Document Organization

Section 1 of this document is the introduction.
Section 2 describes the system architecture.
Section 3 describes the file and database design.
Section 4 describes the human –machine interface
Section 5 describes the detailed design with additional detailed content (detailed diagrams)
Section 6 describes the interfaces external to ATMS.
Section 7 describes the system integrity controls.

1.4 Points of Contact

The key members of the staff are listed below:

CSRA Operations Manager: Sam Jallad (410-872-2120)
CSRA Program Manager: Laura Nicholas (678-861-6569)
CSRA Release Manager: Gary Krebs (678-838-9935)
System Administrator: Kenny Gross (410-582-5680)
Application Delivery Manager: Chris Brennan (410-872-2124)
ATMS Development Lead: Scott Dalrymple (410-872-2128)
Database Administrator: Nick Posteraro (410-872-2125)
Configuration Manager: Delena McFadden-Mello (410-872-2122)
Configuration Manager: Mike Fleming (410-872-2127)
System Test: Mike Sluder (410-872-2129)
System Test: Asha Khatri (410-872-2130)
CHART Project Manager: Dale Lineweaver (410-582-5695)
CHART Program Administrator: Rick Dye (410-582-5619)

1.5 Project References

The following are the list of the relevant ATMS R18 documents. Note that not all are updated for these specific releases:

1. *CHART Program WO 10 ATMS Release 18 Software Requirements*, February 1, 2016, WO10-RS-001

1.6 Glossary

TERM	DESCRIPTION
AJAX	Asynchronous Javascript and XML (or JSON)
AOR	Area of Responsibility representing an area that a person, user, operations center, etc. is responsible for
API	Application Programming Interface
ATMS	Advance Traffic Management System
CHART	Coordinated Highways Action Response Team
CORBA	Common Object Request Broker Architecture
CCTV	Closed Circuit Television
COTS	Commercial Off The Shelf [software or equipment]
CRUD	Create, Read, Update, and Delete (the four standard actions which can be performed on a database table)
DBMS	Database Management System
DMS	Dynamic Message Sign, an electronic sign used to display information to the traveling public
DTMF	Dual Tone Multi-Frequency (touchtone telephone signaling system)
Dynamic Message Sign	An electronic sign used to provide messages to motorists
ERD	Entity Relationship Diagram used to show the relationship between tables in an RDBMS
FMS	Field Management System
Functional Right	A user right, granted to CHART users via Roles. Each operation on a device, including the ability to configure a device, view its sensitive information, and issue commands to the device are controlled by user rights. Users must possess the proper right to be able to perform these actions.
GB	Gigabytes
GIF	Graphic Interchange Format (picture file)
GIS	A Geographic Information System (GIS) is any system that captures, stores, analyzes, manages, and presents data that are linked to location
GUI	Graphical User Interface
HAR	Highway Advisory Radio, a radio station used to broadcast programmable messages to motorists and other travelers regarding traffic and other delays
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
IDL	Interface Definition Language, which describes CORBA interfaces
JAXB	Java API for XML Binding
JDBC	Java Database Connectivity
JDOM	Java Document Object Model
JNI	Java Native Interface, a means of interfacing Java programs with languages written in other languages, such as C++
JRE	Java Runtime Environment
JSON	JavaScript Object Notation
JTS	Java Topology Suite
KB	Kilobytes
LCP	Lane Closure Permit, a permit for the closure of a road for maintenance, or the system used to manage those permits

TERM	DESCRIPTION
MB	Megabytes
MSSQL	Microsoft SQL [Server], the DBMS used in CHART
NSIS	Nullsoft Scriptable Installation System
PDF	Portable Document Format
PR	Problem Report
RDBMS	Relational DBMS
REST	Representational State Transfer
RPC	Remote Procedure Call
RV	Recreational Vehicle
RVDS	Remote Video Display Solution
SDK	Software Development Kit
SFS	Streaming Flash Server
SHA	State Highway Administration
SNMP	Simple Network Management Protocol
SOC	Statewide Operations Center
SQL	Structured Query Language
TSS	Traffic Sensor System
UCD	Use Case Diagram. Depicts a collection of Use Cases.
UML	Unified Modeling Language
XML	Extensible Markup Language
VSD	Video Streaming Device, part of the RVDS
VSS	Video Streamer Service, part of the RVDS

2 SYSTEM ARCHITECTURE

The sections below discuss specific elements of the architecture and software components that are created, changed, or used in CHART ATMS Release 18.

2.1 System Hardware Architecture

CHART ATMS Release 18 includes support for an RVDS server which allows for the streaming of video from ATMS Streaming Servers (SFSs) directly to ATMS Monitors. The actual installation of an RVDS server might not occur until well after this software release is deployed.

2.2 System Software Architecture

CHART ATMS uses the Common Object Request Broker Architecture (CORBA) as the base architecture, with custom built software objects made available on the network allowing their data to be accessed via well-defined CORBA interfaces. Communications to remote devices use the Field Management Server (FMS) architecture. Newer external interfaces such as the User Management web service, Data Exporter, and GIS service employ a web services architecture combining an HTTP request/response structure to pass XML messages.

Except where noted in the subsections below, CHART ATMS Release 18 features do not impact the software architecture of the CHART ATMS.

2.2.1 COTS Products

CHART ATMS uses numerous COTS products for both run-time and development. Table 2-1 contains existing and new COTS products.

Table 2-1. ATMS COTS Products

Product Name	Ver	Description/Purpose	Redistributability	Usage
Angular Java Script Library	1.6.1	The CHART ATMS GUI uses the Angular JavaScript Library, a cross-browser compatible JavaScript library, primarily for specialty gui controls.	Open source	Development
Apache ActiveMQ	5.5	CHART ATMS uses ActiveMQ to connect to RITIS JMS queues for import from RITIS and to export to CHARTWeb for CHART Mapping / CHARTWeb and to RITIS and MD511.	Open source	Runtime
Apache Ant	1.9.6	CHART ATMS uses Apache Jakarta Ant to build CHART applications and deployment jars.	Open source	Development

Product Name	Ver	Description/Purpose	Redistributability	Usage
Apache Commons Lang3	3-3.3.2	CHART uses commons-lang for various string utility methods provided by this library. For example RandomStringUtils class is used to generate random passwords for password reset requests.	Open source	Development
Apache Log4j	1.2.15	CHART uses log4j for logging purposes	Open Source	Development
Apache Tomcat	8.0.30	CHART ATMS uses Apache Tomcat as its web server container. This is used to host the CHART ATMS GUI and all the various CHART ATMS Web Services. The 64-bit (x64) build is used if hosting the GUI and Lane Editor Service only; if any other services are hosted, the 32-bit (x86) build is used.	Open source	Runtime
Apache XML-RPC	3.1.2	CHART ATMS uses the apache xmlrpc java library that uses XML over HTTP to implement remote procedure calls. The video Flash streaming “red button” (“kill switch”) API uses XML over HTTP remote procedure calls.	Open source	Runtime
Core Tec Decoder Control	1.0	CHART ATMS uses a Core Tec supplied decoder control API for commanding Core Tec decoders.	Proprietary	Runtime Development
Datatables JavaScript Library	1.10.13	The CHART ATMS GUI uses the Datatables JavaScript Library, a cross-browser compatible JavaScript library, which provides many features, which provide easy support for display of tabular data..	Open source	Development
Dialogic API	6.0	CHART ATMS uses the Dialogic API for sending and receiving Dual Tone Multi Frequency (DTMF) tones for HAR communications.	Proprietary	Runtime Development
Eclipse	4.4 and higher	The standard Java development environment. CHART ATMS developers collectively use a variety of versions and are free to update at their discretion. However, 4.4 is the minimum required to support Java 8	Open source	Development
GIF89 Encoder	0.90 beta	Utility classes that can create .gif files with optional animation. This utility is used for the creation of DMS True Display windows.	Open source	Development

Product Name	Ver	Description/Purpose	Redistributability	Usage
GNU Bison	2.1	CHART ATMS uses Bison and Flex as part of the process of compiling binary macro files used for performing camera menu operations on Vicon Surveyor VFT cameras.	Open source	Development
GNU Flex	2.5.4a-1	CHART ATMS uses Bison and Flex as part of the process of compiling binary macro files used for performing camera menu operations on Vicon Surveyor VFT cameras.	Open source	Development
iText	2.1.7	CHART ATMS uses iText for PDF document generation	Proprietary	
Jackson	2.1.0	CHART ATMS uses the Jackson Java library to encode/decode strings that use JSON (JavaScript Object Notation).	Open source	Runtime
JacORB Event Service JacORB ORB JacORB Trader	2.3.1 (as patched for CHART ATMS)	CHART ATMS uses a compiled, patched version of JacORB 2.3.1. The JacORB source code, including the custom patched code updated by the CHART ATMS software development team, is kept in the CHART ATMS source repository.	Open source (enhanced with custom CHART ATMS patches)	Runtime Development
Java Runtime Environment (JRE)	1.8.0_74 (a.k.a. 8u74)	The Java Runtime Environment (JRE) is the runtime environment for the CHART ATMS.	Open source	Runtime Installation
JavaHelp	1.1	The JavaHelp system is used to develop the online help system for the CHART ATMS. The text thus developed for the online help is also ported verbatim into the CHART ATMS User's Guide.	Open source	Development Runtime
JavaMail	1.4.4	The CHART ATMS Notification Service uses this API to deliver SMTP mail (notifications).	Open source	Development Runtime
Java SDK	1.8.0_74 (a.k.a. 8u74)	The Oracle Java Software Development Kit (SDK) is the Java compiler for the CHART ATMS.	Open source	Runtime Installation
JavaService	2.0.10.0	CHART ATMS uses JavaService to install the server side Java software components as Windows services.	Open source	Runtime

Product Name	Ver	Description/Purpose	Redistributability	Usage
Java Topology Suite (JTS)	1.8.0	CHART ATMS uses the Java Topology Suite (JTS) for geographical utility classes.	Open source	Runtime Development
JAXB	hudson-jaxb-ri-2.1-833	CHART ATMS uses the jaxb Java library to automate the tedious task of hand-coding field-by-field XML translation and validation for exported data.	Open source	Runtime Development
Jaxen	1.0-beta-8 dated 2002-01-09	The Jaxen project is a Java XPath Engine. Jaxen is a universal object model walker, capable of evaluating XPath expressions across multiple models.	Open source	Runtime Development
JDOM	b7 (beta-7) dated 2001-07-07	CHART ATMS uses JDOM as a way to represent an XML document for easy and efficient reading, manipulation, and writing.	Open source	Development
JIRA	6.4.11	The CHART Program uses JIRA for tracking problem reports (PRs)	Proprietary	Development
joeSNMP	0.2.6 dated 2001-11-11	The joeSNMP project is a Java-based implementation of the SNMP protocol. CHART ATMS uses for commanding Impath MPEG-2 decoders and for communications with NTCIP DMSs.	Open source	Runtime Development
JQuery JavaScript Library	3.1.1	The CHART ATMS GUI uses the JQuery JavaScript Library, a cross-browser compatible JavaScript library, which provides many features, including easy Ajax support.	Open source	Development Runtime
JQuery-UI JavaScript Library	1.12.1	The CHART ATMS GUI uses the JQuery-UI JavaScript Library, a cross-browser compatible JavaScript library, which provides many features, primarily for specialty gui controls including tabbed displays.	Open source	Development Runtime
JSON-simple	1.1	CHART ATMS uses the JSON-simple Java library to encode/decode strings that use JSON (JavaScript Object Notation).	Open source	Runtime Development
JWPlayer JavaScript Library	7.10.2	The CHART ATMS GUI uses the JWPlayer JavaScript Library, a cross-browser compatible JavaScript library, for displaying desktop video.	Open source	Development Runtime

Product Name	Ver	Description/Purpose	Redistributability	Usage
Krakatau PM	2.11	CHART ATMS uses Krakatau PM by Power Software for source code metrics.	Proprietary	Administrative
Microsoft SQL Server	2008 R2 and 2005	CHART ATMS uses Microsoft SQL Server 2008 to host its databases. It uses the same version for retrieving roadway location, weather, and traffic signal data from CHART Mapping and lane closure permits from LCP. The reporting component EORS v2 uses SQL Server 2005.	Proprietary	Runtime
Microsoft SQL Server JDBC Driver	4.0	CHART ATMS Java software accesses the Microsoft SQL Server database using the JDBC Driver 4.0 produced by Microsoft for this purpose.	Proprietary	Development Runtime
Microsoft Visual C++	6, Service Pack (SP) 6	Although for the most part CHART ATMS has migrated to Visual Studio 2012 Ultimate for C++, CHART ATMS still uses Visual C++ Version 6, Service Pack 6 C++ library files for the previously compiled legacy V1500 Manager. Necessary library files are used in the runtime environment.	Proprietary	Runtime
Microsoft Visual Studio	2012 Ultimate	CHART ATMS uses Microsoft Visual Studio 2012 Ultimate for C++ source code development. Necessary library files are used in the runtime environment. These include elements of earlier versions as well (2010, 2008, and 2005).	Proprietary	Development Runtime
Microsoft Windows	2008 Server	CHART ATMS uses Microsoft Windows 2008 Server as its standard runtime platform for the CHART ATMS application servers, database servers, FMS servers, and GUI servers.	Proprietary	Runtime
NeoSpeech	3.11.5	Text to Speech Engine	Proprietary	Runtime
Nullsoft Scriptable Install System	2.20	CHART ATMS uses the Nullsoft Scriptable Install System (NSIS) as the installation package for CHART NTCIP Conformance Test components, for NTCIP DMS and NTCIP cameras.	Open source	Development Installation

Product Name	Ver	Description/Purpose	Redistributability	Usage
OpenLayers	2.13.1	The CHART ATMS Map feature uses the OpenLayers JavaScript API 2.8 (http://openlayers.org/) in order to render interactive maps within a web application without relying on vendor specific software. OpenLayers is an open source product released under a BSD style license which can be found at (http://svn.openlayers.org/trunk/openlayers/license.txt).	Open source	Development Runtime
O'Reilly Servlet	1.11	Provides classes that allow the CHART ATMS GUI to handle file uploads via multi-part form submission.	Open source	Development Runtime
Prototype JavaScript Library	1.7.2	The CHART ATMS GUI uses the Prototype JavaScript Library, a cross-browser compatible JavaScript library, which provides many features, including easy Ajax support.	Open source	Development Runtime
RedGate SQL Backup Pro	6	CHART ATMS uses these parts of the RedGate DBA Bundle monitoring tools to support the backup and restore processes and to monitor database performance	Proprietary	Runtime
RedGate SQL Monitor	2.3.0			
Robohelp	10	CHART ATMS developers use Robohelp to author the online help and to generate the CHART ATMS User's Guide, which is a Word document generated from the online help.	Proprietary	Development
SAXPath	1.0-beta-6 dated 2001-09-27	CHART ATMS uses SAXPath, an event-based API for XPath parsers, that is, for parsers which parse XPath expressions.	Open source	Runtime Development
Sparx Enterprise Architect	9.3.934	CHART ATMS developers use Enterprise Architect by Sparx for UML modeling and design tool.	Proprietary	Development
Subversion	1.6	CHART ATMS uses Apache Subversion for source code control.	Open source	Development
Subversion browser TortoiseSVN	1.6.15	Official CHART ATMS builds use TortoiseSVN subversion browser. Some developers may use TortoiseSVN as well.	Open source	Development

Product Name	Ver	Description/Purpose	Redistributability	Usage
Tritonus	0.3.6	The CHART ATMS uses the Tritonus implementation of the Java Sound API for manipulating audio files.	Open source	Development Runtime
Turnkey-RVDS	2.0.4	The CHART ATMS uses the Turnkey-RVDS to display Streaming Flash video on physical monitors.	Proprietary	Runtime
Velocity Template Engine	1.6.1	Provides classes that CHART ATMS GUI uses in order to create dynamic web pages using velocity templates.	Open source	Runtime Development
vRanger Backup & Replication	5.3.1	The CHART Program uses vRanger Backup & Replication by Quest Software to maintain system backups. This subsystem is not part of the CHART ATMS per se, but serves in a support role. Therefore it is listed as having Administrative usage, rather than Runtime usage.	Proprietary	Administrative
XML Spy	2009 Pro SP 1	CHART ATMS developers use XMLSpy to visualize, edit, and generate XML and XSLT used by the CHART ATMS and by some of the external systems which interface with the CHART ATMS.	Proprietary	Development

2.2.2 Component Deployment

The diagram below describes the expected deployment of ATMS components.

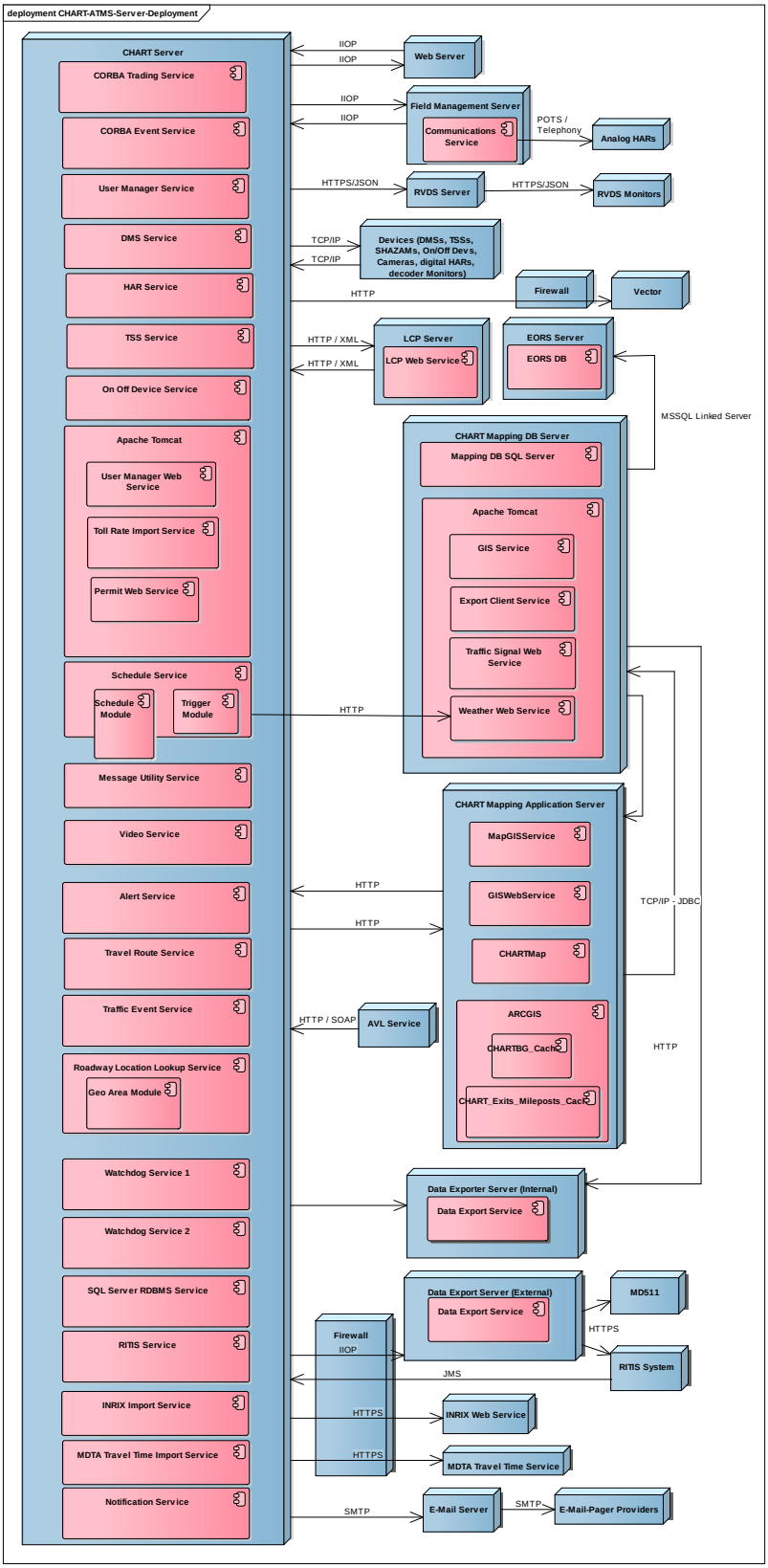


Figure 2-1. R18 Server Deployment

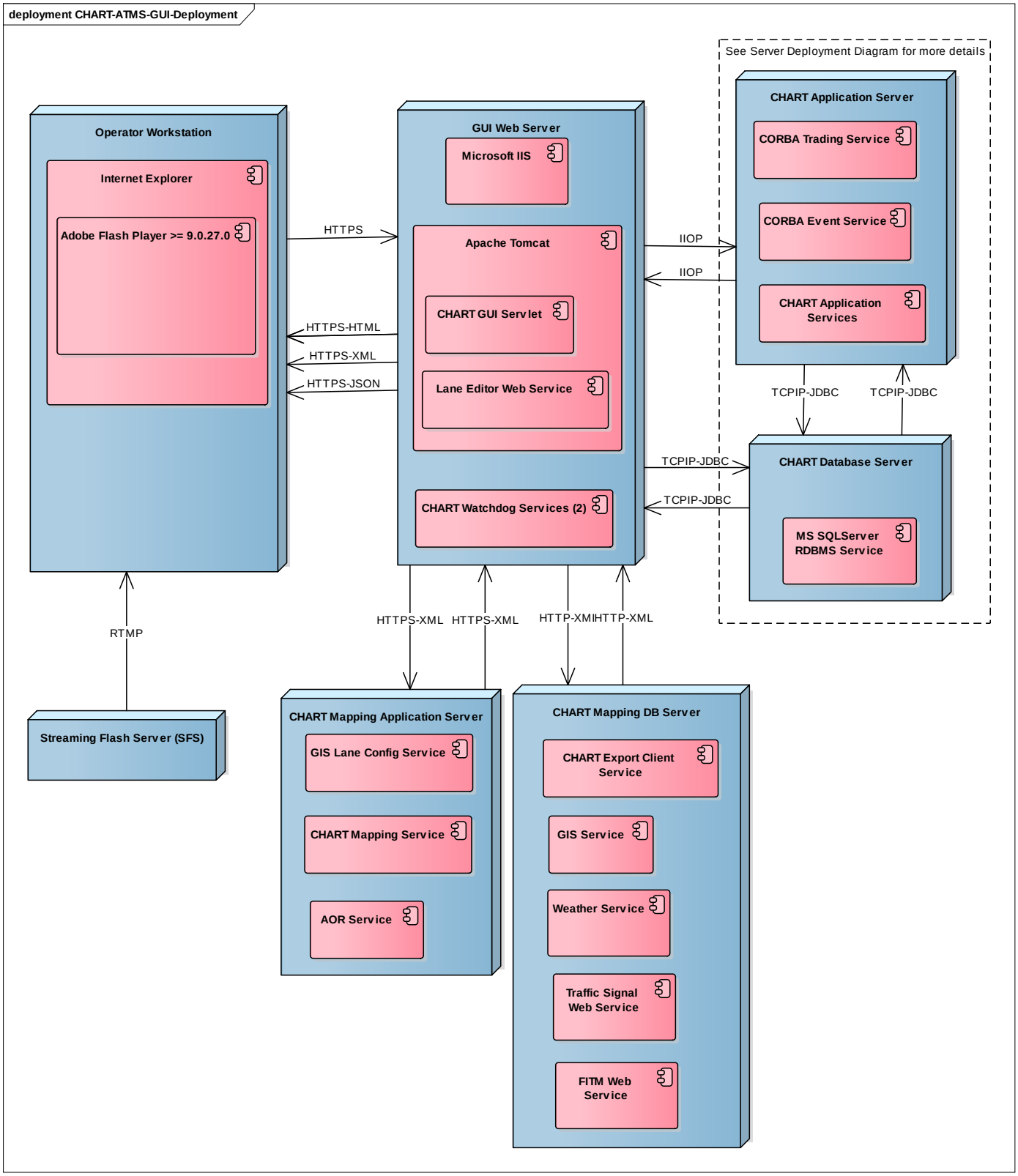


Figure 2-2. R18 GUI Deployment

2.2.3 Internal Interfaces

This section describes the internal interfaces added or modified in Release 18 of the CHART ATMS system.

N/A for Release 18.

2.3 Internal Communications Architecture

The overall communications architecture of ATMS is depicted in Figure 1-2. There are no internal communications architecture changes for ATMS R18.

3 FILE AND DATABASE DESIGN

The CHART ATMS stores most of its data in a non-spatial MS SQL Server database. Additionally, location aliases are stored in a spatial SQL Server database. Some data is stored in flat files on the CHART servers.

This section describes all of these types of data.

3.1 Database Management System Files

CHART ATMS Release 18 is tested and delivered with the fielded MS SQL Server version..

3.1.1 ATMS

CHART ATMS Release 18 is tested and delivered with the fielded MS SQL Server version.

3.1.1.1 Overview

An overview of the changes made to the CHART ATMS database design for Release 18 features are described below.

3.1.1.1.1 ATMS-887 NTCIP DMS: Consider Skipping FontStatus Check on Per DMS Basis

One column is added to the DMS table, called NTCIP_FONT_MGMT_OPTION. It is a numeric field and can have a value of 0, 1, or 2 (or null, which is equivalent to 0).

3.1.1.1.2 ATMS-2523 Incorporate Skyline/Turnkey RVDS-based Decoder into ATMS

Three columns are added to the CODEC table: RVDS_MAC_ADDR (a nullable string of length 17), and RVDS_VIRT_MON_NUM (a tinyint which can range between 1 and 16 inclusive). One new table, named CODEC_STREAMING_SERVER will link a RVDS monitor (via its virtual CODEC) to one or more reachable streaming servers. It contains CODEC_ID, the ID of a CODEC, and an SSC_ID, the ID of a STREAMING_SERVER_CONFIG. Also, the foreign key constraint VIDEO_FABRIC_FK is dropped on the table CODEC_VIDEO_CONNECTION: the FABRIC_ID column in that table can now be the “null identifier” (which is a string of 32 zeros, not a database null), which does not exist as a row in the VIDEO_FABRIC table).

3.1.1.2 Database Architecture

Except as noted, CHART ATMS Release 18 features do not impact the overall architecture of the CHART ATMS database.

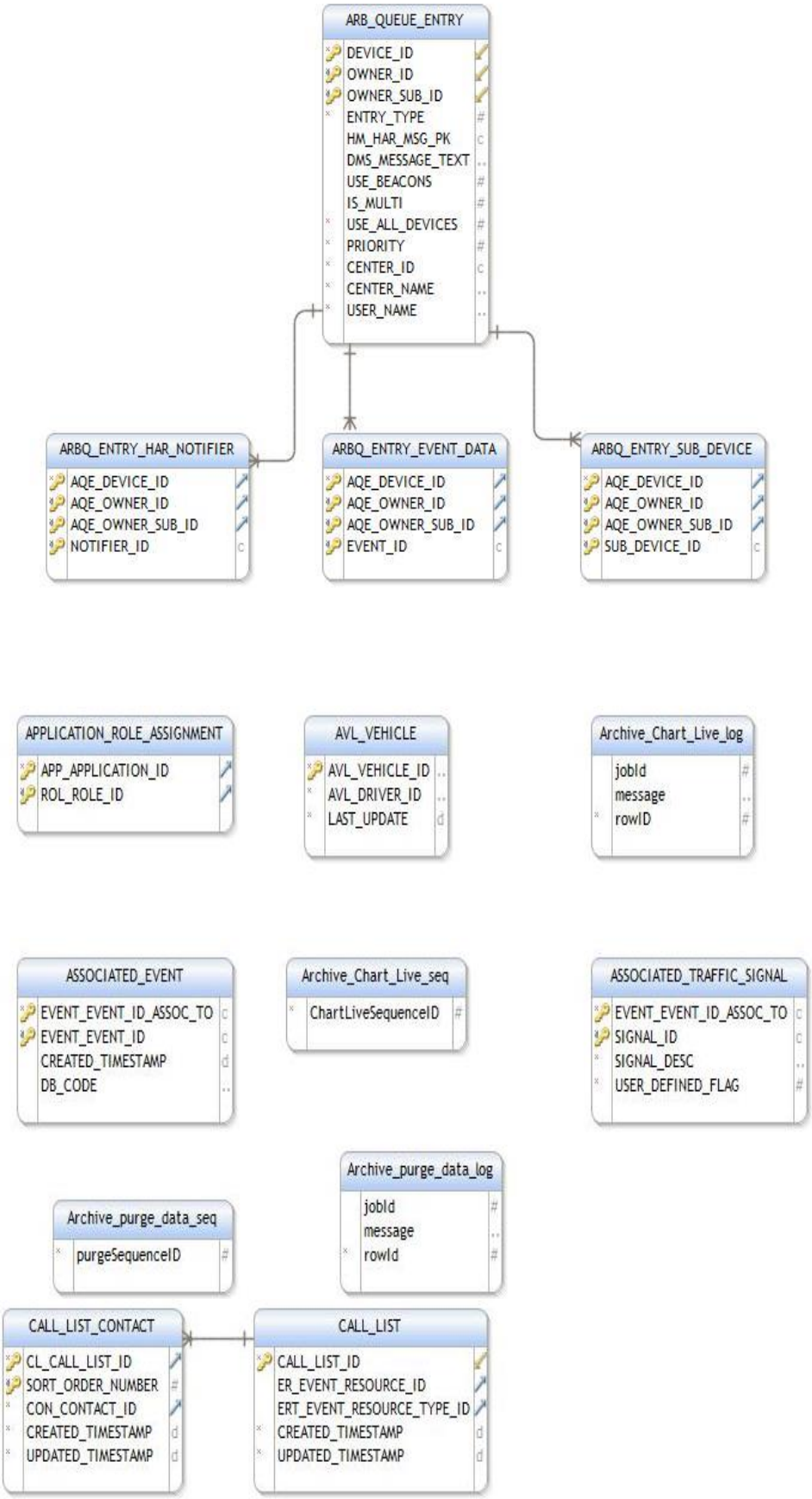
3.1.1.2.1 Logical Design

Appendix A CHART Live Database Entity Relationship Diagram (ERD)

This section provides Entity Relationship Diagrams (ERDs) for the database schema used in the current release of the CHART ATMS. Figure 3-1 is a full ERD diagram for the entire database.

Subsequent diagrams in this appendix are child ERDs representing the database grouped roughly in alphabetical order.

Figure 3-1. CHART_Live ERD, Visual Table of Contents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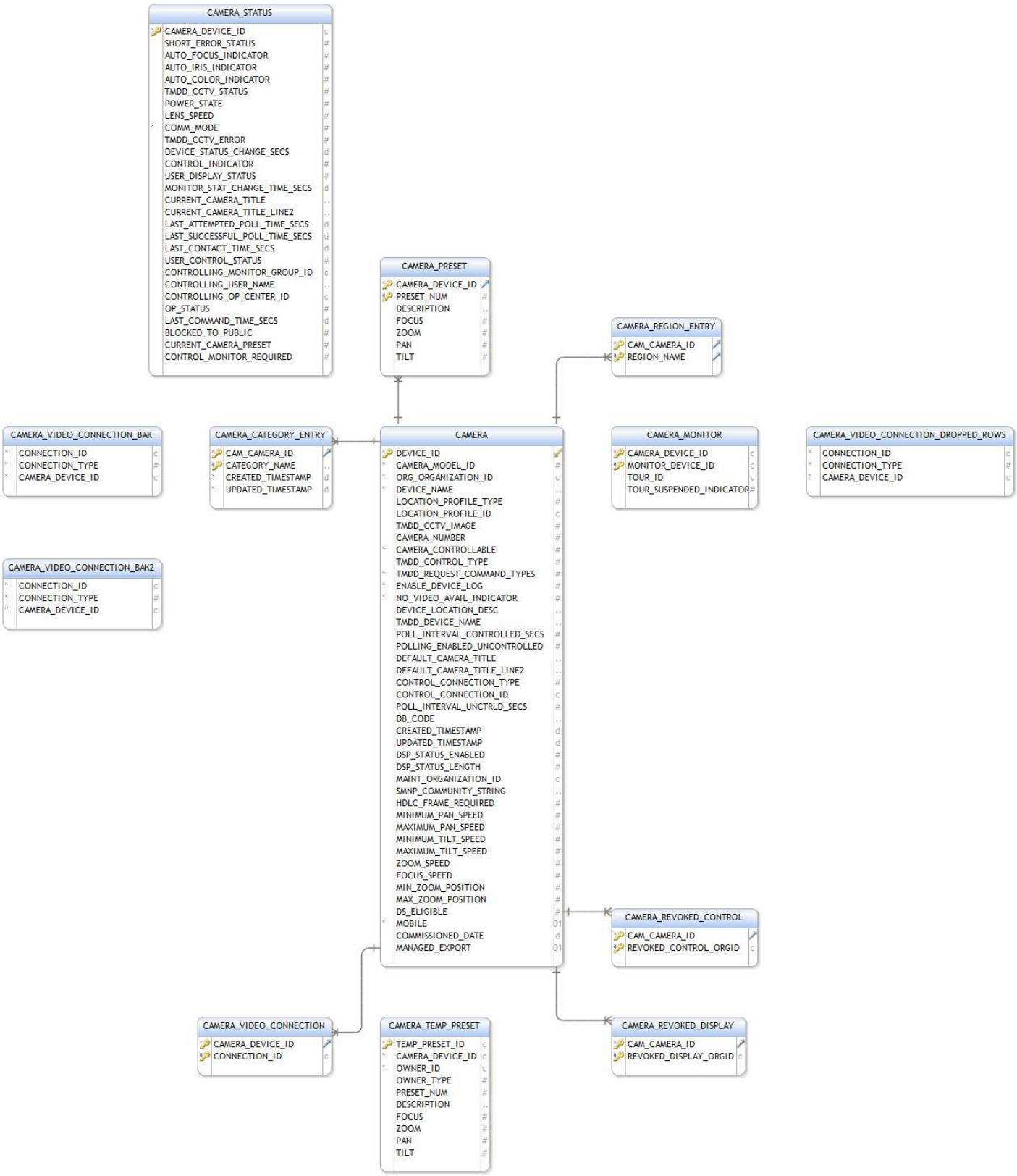
DEVICE_ID
OWNER_ID
OWNER_SUB_ID
ENTRY_TYPE
HM_HAR_MSG_PK
DMS_MESSAGE_TEXT
USE_BEACONS
IS_MULTI
USE_ALL_DEVICES
PRIORITY
CENTER_ID
CENTER_NAME
USER_NAME
ARBQ_ENTRY_HAR_NOTIFIER
AQE_DEVICE_ID
AQE_OWNER_ID
AQE_OWNER_SUB_ID
NOTIFIER_ID
ARBQ_ENTRY_EVENT_DATA
AQE_DEVICE_ID
AQE_OWNER_ID
AQE_OWNER_SUB_ID
EVENT_ID
ARBQ_ENTRY_SUB_DEVICE
AQE_DEVICE_ID
AQE_OWNER_ID
AQE_OWNER_SUB_ID
SUB_DEVICE_ID
APPLICATION_ROLE_ASSIGNMENT
APP_APPLICATION_ID
ROL_ROLE_ID
AVL_VEHICLE
AVL_VEHICLE_ID
AVL_DRIVER_ID
LAST_UPDATE
Archive_Chart_Live_log
jobId
message
rowID
ASSOCIATED_EVENT
EVENT_EVENT_ID_ASSOC_TO
EVENT_EVENT_ID
CREATED_TIMESTAMP
DB_CODE
Archive_Chart_Live_seq
ChartLiveSequenceID
ASSOCIATED_TRAFFIC_SIGNAL
EVENT_EVENT_ID_ASSOC_TO
SIGNAL_ID
SIGNAL_DESC
USER_DEFINED_FLAG
Archive_purge_data_log
jobId
message
rowId
Archive_purge_data_seq
purgeSequenceID
CALL_LIST_CONTACT
CL_CALL_LIST_ID
SORT_ORDER_NUMBER
CON_CONTACT_ID
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
CALL_LIST
CALL_LIST_ID
ER_EVENT_RESOURCE_ID
ERT_EVENT_RESOURCE_TYPE_ID
CREATED_TIMESTAMP
UPDATED_TIMESTAMP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AUTO_IRIS_INDICATOR
AUTO_COLOR_INDICATOR
TMDD_CCTV_STATUS
POWER_STATE
LENS_SPEED
COMM_MODE
TMDD_CCTV_ERROR
DEVICE_STATUS_CHANGE_SECS
CONTROL_INDICATOR
USER_DISPLAY_STATUS
MONITOR_STAT_CHANGE_TIME_SECS
CURRENT_CAMERA_TITLE
CURRENT_CAMERA_TITLE_LINE2
LAST_ATTEMPTED_POLL_TIME_SECS
LAST_SUCCESSFUL_POLL_TIME_SECS
LAST_CONTACT_TIME_SECS
USER_CONTROL_STATUS
CONTROLLING_MONITOR_GROUP_ID
CONTROLLING_USER_NAME
CONTROLLING_OP_CENTER_ID
OP_STATUS
LAST_COMMAND_TIME_SECS
BLOCKED_TO_PUBLIC
CURRENT_CAMERA_PRESET
CONTROL_MONITOR_REQUIRED
CAMERA_PRESET
CAMERA_DEVICE_ID
PRESET_NUM
DESCRIPTION
FOCUS
ZOOM
PAN
TILT
CAMERA_REGION_ENTRY
CAM_CAMERA_ID
REGION_NAME
CAMERA_VIDEO_CONNECTION_BAK
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CONNECTION_TYPE
CAMERA_DEVICE_ID
CAMERA_CATEGORY_ENTRY
CAM_CAMERA_ID
CATEGORY_NAME
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UPDATED_TIMESTAMP
CAMERA
DEVICE_ID
CAMERA_MODEL_ID
ORG_ORGANIZATION_ID
DEVICE_NAME
LOCATION_PROFILE_TYPE
LOCATION_PROFILE_ID
TMDD_CCTV_IMAGE
CAMERA_NUMBER
CAMERA_CONTROLLABLE
TMDD_CONTROL_TYPE
TMDD_REQUEST_COMMAND_TYPES
ENABLE_DEVICE_LOG
NO_VIDEO_AVAIL_INDICATOR
DEVICE_LOCATION_DESC
TMDD_DEVICE_NAME
POLL_INTERVAL_CONTROLLED_SECS
POLLING_ENABLED_UNCONTROLLED
DEFAULT_CAMERA_TITLE
DEFAULT_CAMERA_TITLE_LINE2
CONTROL_CONNECTION_TYPE
CONTROL_CONNECTION_ID
POLL_INTERVAL_UNCTRLD_SECS
DB_CODE
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DSP_STATUS_ENABLED
DSP_STATUS_LENGTH
MAINT_ORGANIZATION_ID
SMNP_COMMUNITY_STRING
HDLC_FRAME_REQUIRED
MINIMUM_PAN_SPEED
MAXIMUM_PAN_SPEED
MINIMUM_TILT_SPEED
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ZOOM_SPEED
FOCUS_SPEED
MIN_ZOOM_POSITION
MAX_ZOOM_POSITION
DS_ELIGIBLE
MOBILE
COMMISSIONED_DATE
MANAGED_EXPORT
CAMERA_MONITOR
CAMERA_DEVICE_ID
MONITOR_DEVICE_ID
TOUR_ID
TOUR_SUSPENDED_INDICATOR
CAMERA_VIDEO_CONNECTION_DROPPED_ROWS
CONNECTION_ID
CONNECTION_TYPE
CAMERA_DEVICE_ID
CAMERA_VIDEO_CONNECTION_BAK2
CONNECTION_ID
CONNECTION_TYPE
CAMERA_DEVICE_ID
CAMERA_REVOKED_CONTROL
CAM_CAMERA_ID
REVOKED_CONTROL_ORGID
CAMERA_VIDEO_CONNECTION
CAMERA_DEVICE_ID
CONNECTION_ID
CAMERA_TEMP_PRESET
TEMP_PRESET_ID
CAMERA_DEVICE_ID
OWNER_ID
OWNER_TYPE
PRESET_NUM
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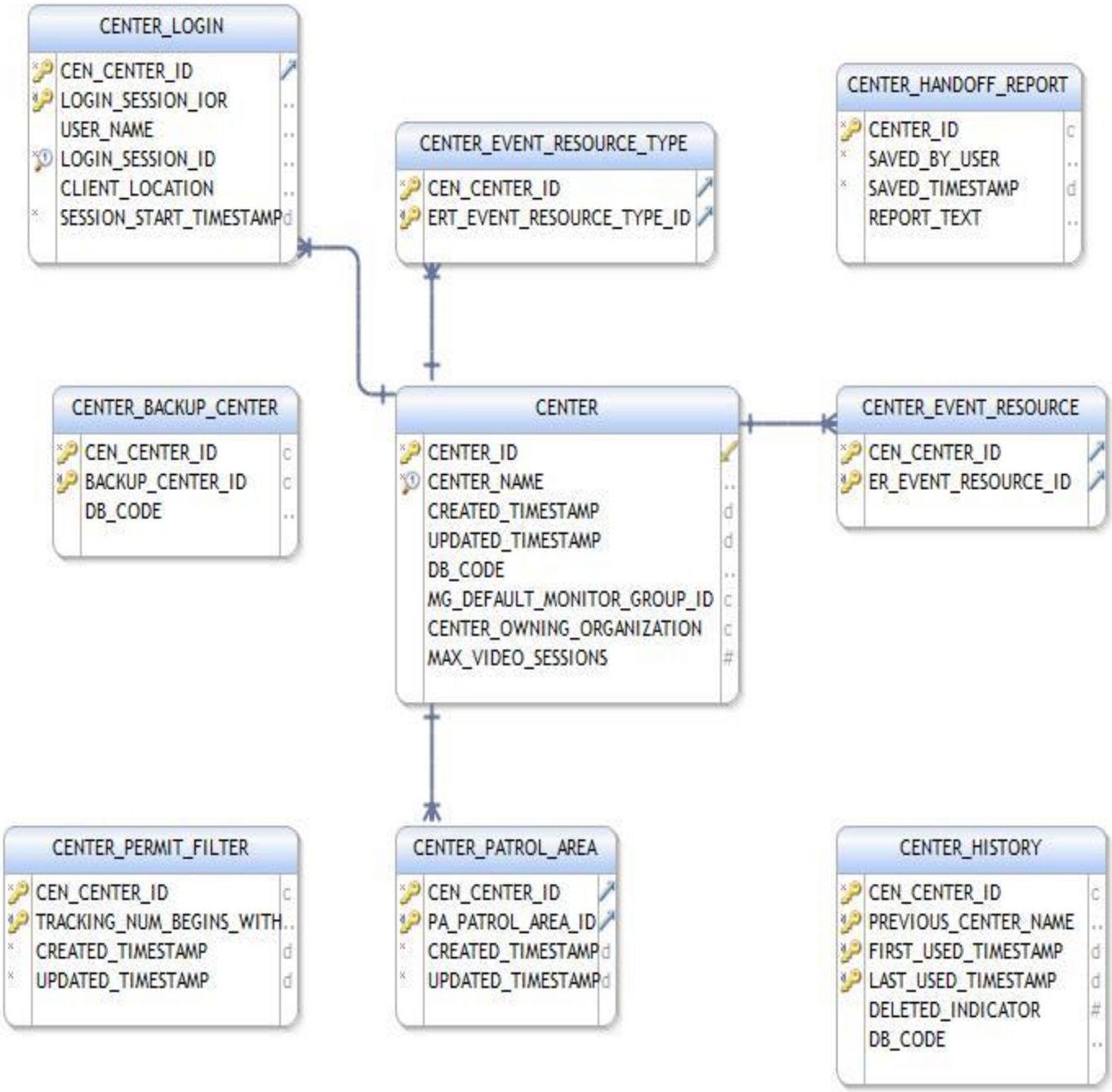
ZOOM
PAN
TILT
CAMERA_REVOKED_DISPLAY
CAM_CAMERA_ID
REVOKED_DISPLAY_ORGID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LOGIN_SESSION_ID
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CEN_CENTER_ID
ERT_EVENT_RESOURCE_TYPE_ID
CENTER_HANDOFF_REPORT
CENTER_ID
SAVED_BY_USER
SAVED_TIMESTAMP
REPORT_TEXT
CENTER_BACKUP_CENTER
CEN_CENTER_ID
BACKUP_CENTER_ID
DB_CODE
CENTER
CENTER_ID
CENTER_NAME
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DB_CODE
MG_DEFAULT_MONITOR_GROUP_ID
CENTER_OWNING_ORGANIZATION
MAX_VIDEO_SESSIONS
CENTER_EVENT_RESOURCE
CEN_CENTER_ID
ER_EVENT_RESOURCE_ID
CENTER_PERMIT_FILTER
CEN_CENTER_ID
TRACKING_NUM_BEGINS_WITH
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
CENTER_PATROL_AREA
CEN_CENTER_ID
PA_PATROL_AREA_ID
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
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LAST_USED_TIMESTAMP
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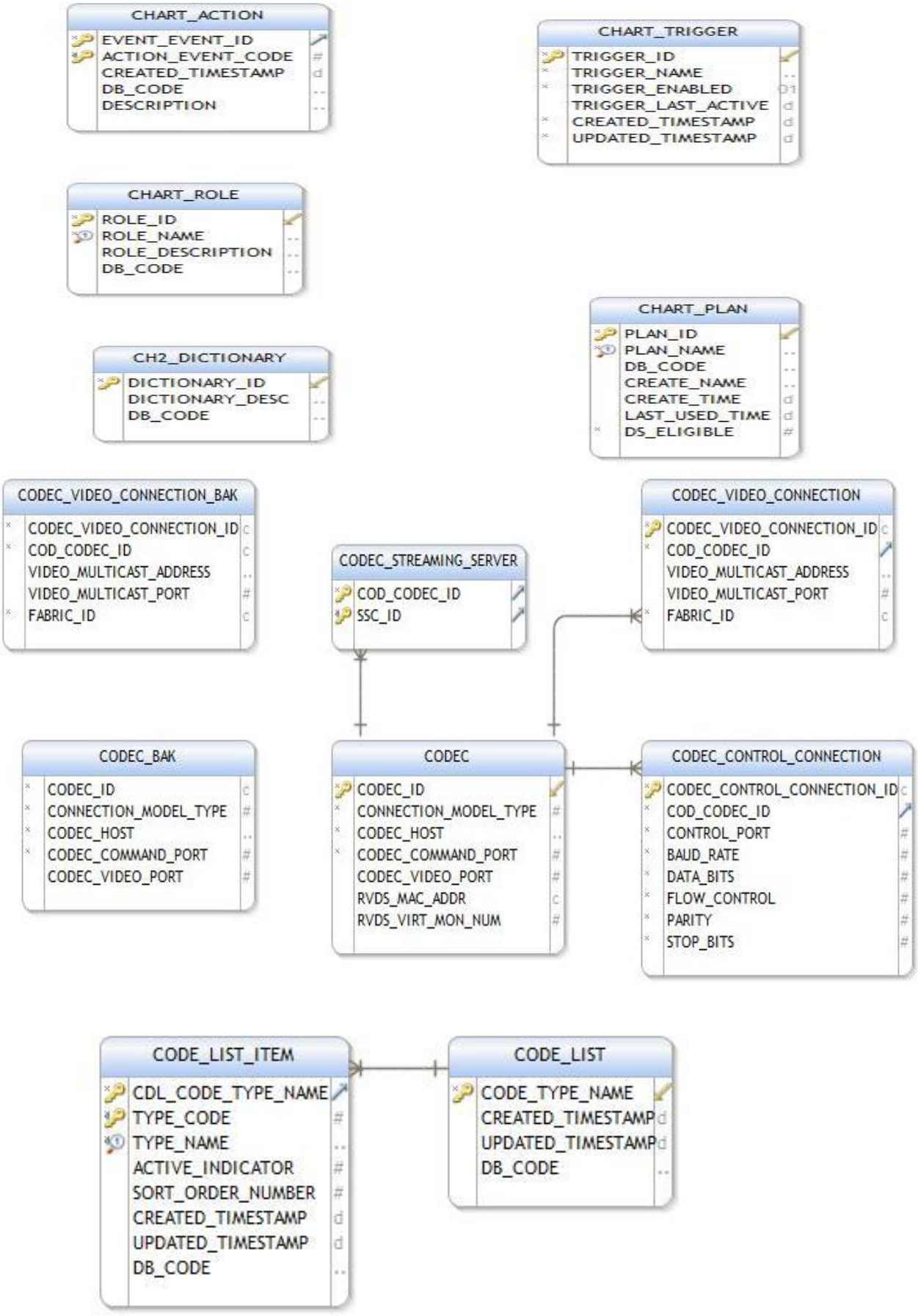
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TRIGGER_LAST_ACTIVE
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
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ROLE_ID
ROLE_NAME
ROLE_DESCRIPTION
DB_CODE
CHART_PLAN
PLAN_ID
PLAN_NAME
DB_CODE
CREATE_NAME
CREATE_TIME
LAST_USED_TIME
DS_ELIGIBLE
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DICTIONARY_ID
DICTIONARY_DESC
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CODEC_VIDEO_CONNECTION_ID
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VIDEO_MULTICAST_PORT
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CODEC_STREAMING_SERVER
COD_CODEC_ID
SSC_ID
CODEC_VIDEO_CONNECTION
CODEC_VIDEO_CONNECTION_ID
COD_CODEC_ID
VIDEO_MULTICAST_ADDRESS
VIDEO_MULTICAST_PORT
FABRIC_ID
CODEC_BAK
CODEC_ID
CONNECTION_MODEL_TYPE
CODEC_HOST
CODEC_COMMAND_PORT
CODEC_VIDEO_PORT
CODEC
CODEC_ID
CONNECTION_MODEL_TYPE
CODEC_HOST
CODEC_COMMAND_PORT
CODEC_VIDEO_PORT
RVDS_MAC_ADDR
RVDS_VIRT_MON_NUM
CODEC_CONTROL_CONNECTION
CODEC_CONTROL_CONNECTION_ID
COD_CODEC_ID
CONTROL_PORT
BAUD_RATE
DATA_BITS
FLOW_CONTROL
PARITY
STOP_BITS
CODE_LIST_ITEM
CDL_CODE_TYPE_NAME
TYPE_CODE
TYPE_NAME
ACTIVE_INDICATOR
SORT_ORDER_NUMBER
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UPDATED_TIMESTAMP
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CODE_LIST
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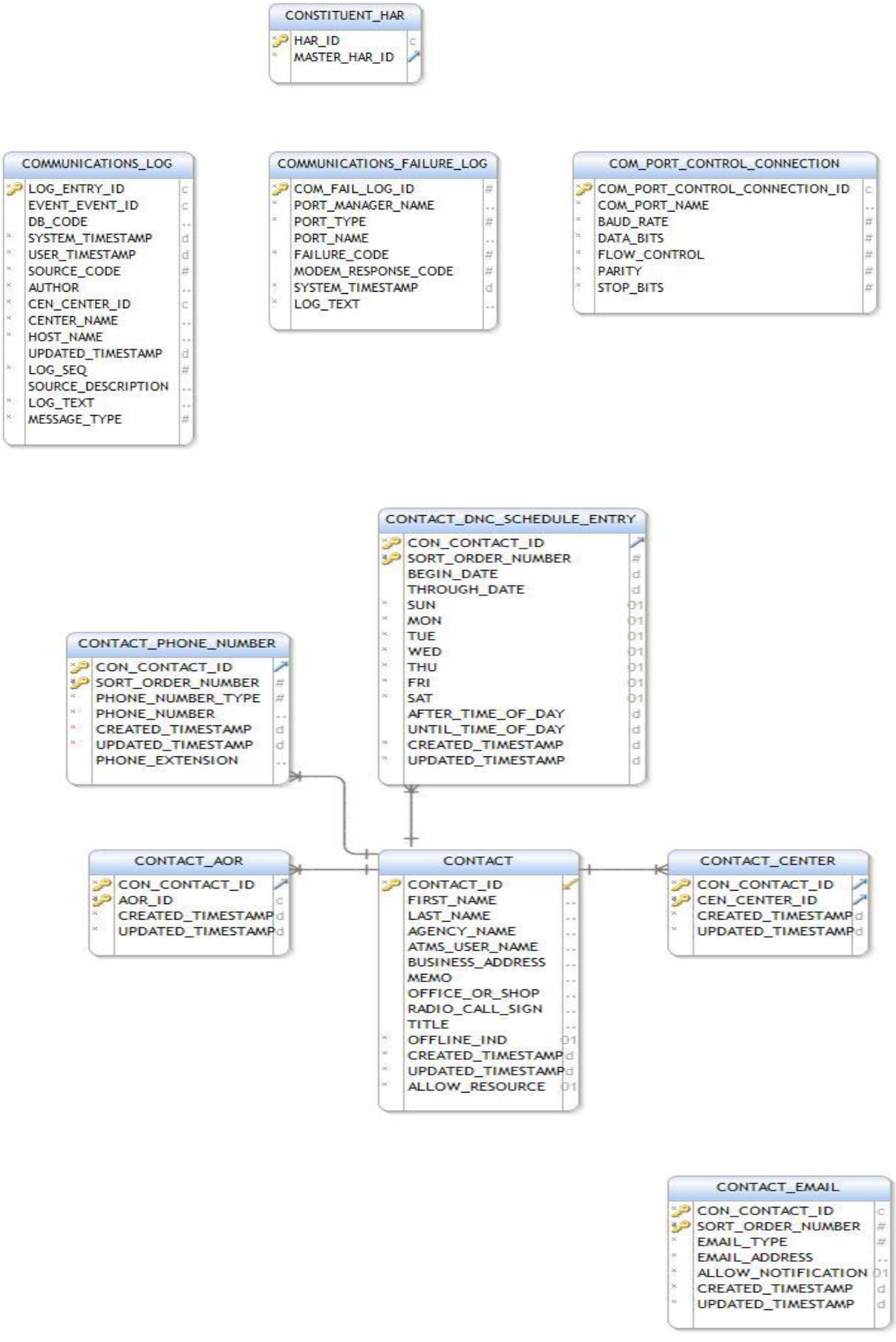
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DB_CODE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CENTER_NAME
HOST_NAME
UPDATED_TIMESTAMP
LOG_SEQ
SOURCE_DESCRIPTION
LOG_TEXT
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PORT_TYPE
PORT_NAME
FAILURE_CODE
MODEM_RESPONSE_CODE
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COM_PORT_CONTROL_CONNECTION_ID
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FLOW_CONTROL
PARITY
STOP_BITS
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SORT_ORDER_NUMBER
BEGIN_DATE
THROUGH_DATE
SUN
MON
TUE
WED
THU
FRI
SAT
AFTER_TIME_OF_DAY
UNTIL_TIME_OF_DAY
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
CONTACT_PHONE_NUMBER
CON_CONTACT_ID
SORT_ORDER_NUMBER
PHONE_NUMBER_TYPE
PHONE_NUMBER
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
PHONE_EXTENSION
CONTACT_AOR
CON_CONTACT_ID
AOR_ID
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
CONTACT
CONTACT_ID
FIRST_NAME
LAST_NAME
AGENCY_NAME
ATMS_USER_NAME
BUSINESS_ADDRESS
MEMO
OFFICE_OR_SHOP
RADIO_CALL_SIGN
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OFFLINE_IND
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UPDATED_TIMESTAMP
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CEN_CENTER_ID
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
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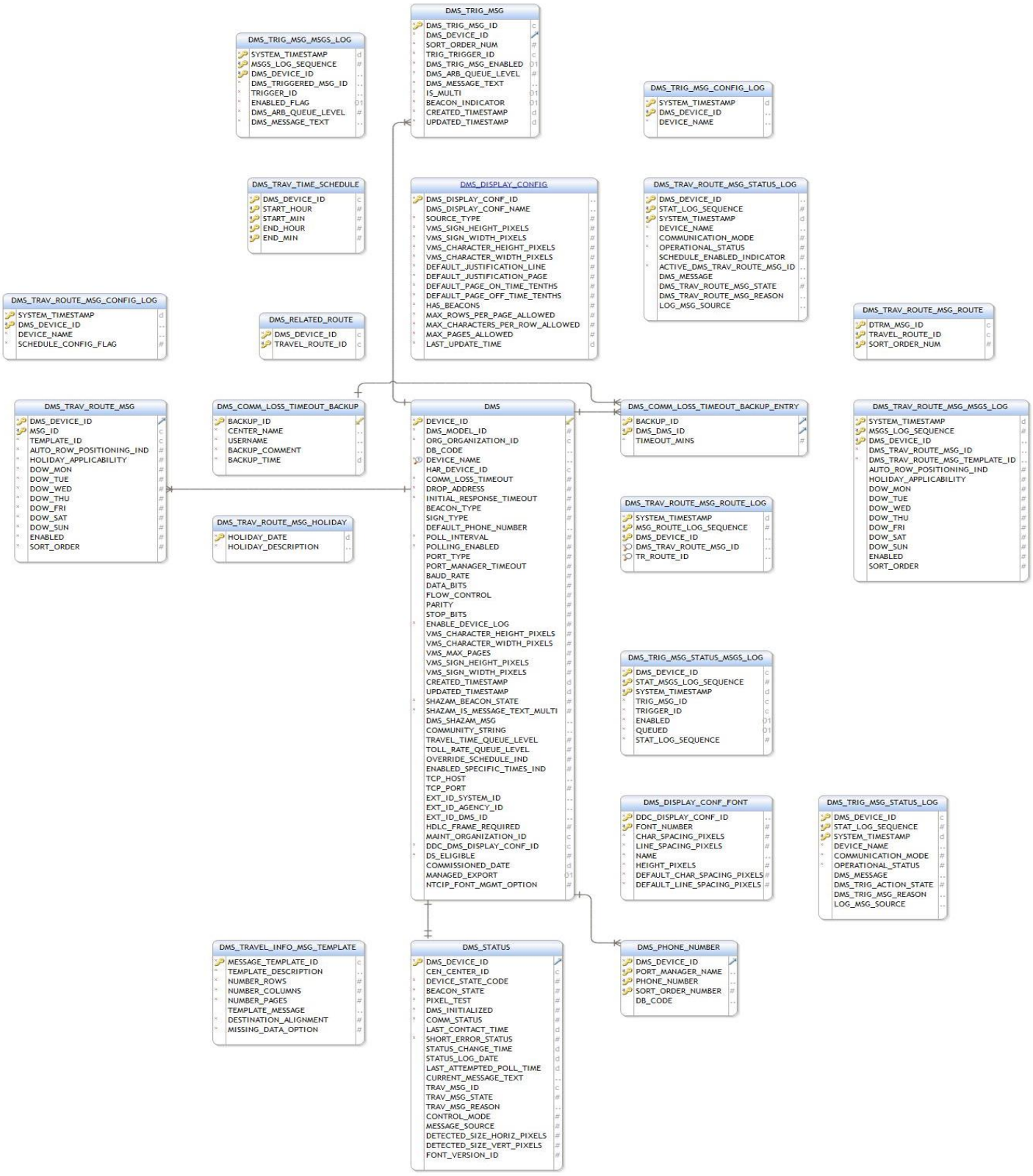
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SORT_ORDER_NUM
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DMS_TRIG_MSG_ENABLED
DMS_ARB_QUEUE_LEVEL
DMS_MESSAGE_TEXT
IS_MULTI
BEACON_INDICATOR
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
DMS_TRIG_MSG_MSGS_LOG
SYSTEM_TIMESTAMP
MSGS_LOG_SEQUENCE
DMS_DEVICE_ID
DMS_TRIGGERED_MSG_ID
TRIGGER_ID
ENABLED_FLAG
DMS_ARB_QUEUE_LEVEL
DMS_MESSAGE_TEXT
DMS_TRIG_MSG_CONFIG_LOG
SYSTEM_TIMESTAMP
DMS_DEVICE_ID
DEVICE_NAME
DMS_TRAV_TIME_SCHEDULE
DMS_DEVICE_ID
START_HOUR
START_MIN
END_HOUR
END_MIN
DMS_DISPLAY_CONFIG
DMS_DISPLAY_CONF_ID
DMS_DISPLAY_CONF_NAME
SOURCE_TYPE
VMS_SIGN_HEIGHT_PIXELS
VMS_SIGN_WIDTH_PIXELS
VMS_CHARACTER_HEIGHT_PIXELS
VMS_CHARACTER_WIDTH_PIXELS
DEFAULT_JUSTIFICATION_LINE
DEFAULT_JUSTIFICATION_PAGE
DEFAULT_PAGE_ON_TIME_TENTHS
DEFAULT_PAGE_OFF_TIME_TENTHS
HAS_BEACONS
MAX_ROWS_PER_PAGE_ALLOWED
MAX_CHARACTERS_PER_ROW_ALLOWED
MAX_PAGES_ALLOWED
LAST_UPDATE_TIME
DMS_TRAV_ROUTE_MSG_STATUS_LOG
DMS_DEVICE_ID
STAT_LOG_SEQUENCE
SYSTEM_TIMESTAMP
DEVICE_NAME
COMMUNICATION_MODE
OPERATIONAL_STATUS
SCHEDULE_ENABLED_INDICATOR
ACTIVE_DMS_TRAV_ROUTE_MSG_ID
DMS_MESSAGE
DMS_TRAV_ROUTE_MSG_STATE
DMS_TRAV_ROUTE_MSG_REASON
LOG_MSG_SOURCE
DMS_TRAV_ROUTE_MSG_CONFIG_LOG
SYSTEM_TIMESTAMP
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DEVICE_NAME
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DMS_RELATED_ROUTE
DMS_DEVICE_ID
TRAVEL_ROUTE_ID
DMS_TRAV_ROUTE_MSG_ROUTE
DTRM_MSG_ID
TRAVEL_ROUTE_ID
SORT_ORDER_NUM
DMS_TRAV_ROUTE_MSG
DMS_DEVICE_ID
MSG_ID
TEMPLATE_ID
AUTO_ROW_POSITIONING_IND
HOLIDAY_APPLICABILITY
DOW_MON
DOW_TUE
DOW_WED
DOW_THU
DOW_FRI
DOW_SAT
DOW_SUN
ENABLED
SORT_ORDER
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CENTER_NAME
USERNAME
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DEVICE_ID
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ORG_ORGANIZATION_ID
DB_CODE
DEVICE_NAME
HAR_DEVICE_ID
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DROP_ADDRESS
INITIAL_RESPONSE_TIMEOUT
BEACON_TYPE
SIGN_TYPE
DEFAULT_PHONE_NUMBER
POLL_INTERVAL
POLLING_ENABLED
PORT_TYPE
PORT_MANAGER_TIMEOUT
BAUD_RATE
DATA_BITS
FLOW_CONTROL
PARITY
STOP_BITS
ENABLE_DEVICE_LOG
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VMS_CHARACTER_WIDTH_PIXELS
VMS_MAX_PAGES
VMS_SIGN_HEIGHT_PIXELS
VMS_SIGN_WIDTH_PIXELS
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
SHAZAM_BEACON_STATE
SHAZAM_IS_MESSAGE_TEXT_MULTI
DMS_SHAZAM_MSG
COMMUNITY_STRING
TRAVEL_TIME_QUEUE_LEVEL
TOLL_RATE_QUEUE_LEVEL
OVERRIDE_SCHEDULE_IND
ENABLED_SPECIFIC_TIMES_IND
TCP_HOST
TCP_PORT
EXT_ID_SYSTEM_ID
EXT_ID_AGENCY_ID
EXT_ID_DMS_ID
HDLC_FRAME_REQUIRED
MAINT_ORGANIZATION_ID
DDC_DMS_DISPLAY_CONF_ID
DS_ELIGIBLE
COMMISSIONED_DATE
MANAGED_EXPORT
NTCIP_FONT_MGMT_OPTION
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BACKUP_ID
DMS_DMS_ID
TIMEOUT_MINS
DMS_TRAV_ROUTE_MSG_MSGS_LOG
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MSGS_LOG_SEQUENCE
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DMS_TRAV_ROUTE_MSG_ID
DMS_TRAV_ROUTE_MSG_TEMPLATE_ID
AUTO_ROW_POSITIONING_IND
HOLIDAY_APPLICABILITY
DOW_MON
DOW_TUE
DOW_WED
DOW_THU
DOW_FRI
DOW_SAT
DOW_SUN
ENABLED
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HOLIDAY_DATE
HOLIDAY_DESCRIPTION
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TR_ROUTE_ID
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TRIGGER_ID
ENABLED
QUEUED
STAT_LOG_SEQUENCE
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DDC_DISPLAY_CONF_ID
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CHAR_SPACING_PIXELS
LINE_SPACING_PIXELS
NAME
HEIGHT_PIXELS
DEFAULT_CHAR_SPACING_PIXELS
DEFAULT_LINE_SPACING_PIXELS
DMS_TRIG_MSG_STATUS_LOG
DMS_DEVICE_ID
STAT_LOG_SEQUENCE
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DEVICE_NAME
COMMUNICATION_MODE
OPERATIONAL_STATUS
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DMS_TRIG_ACTION_STATE
DMS_TRIG_MSG_REASON
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MESSAGE_TEMPLATE_ID
TEMPLATE_DESCRIPTION
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NUMBER_COLUMNS
NUMBER_PAGES
TEMPLATE_MESSAGE
DESTINATION_ALIGNMENT
MISSING_DATA_OPTION
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CEN_CENTER_ID
DEVICE_STATE_CODE
BEACON_STATE
PIXEL_TEST
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COMM_STATUS
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SHORT_ERROR_STATUS
STATUS_CHANGE_TIME
STATUS_LOG_DATE
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TRAV_MSG_STATE
TRAV_MSG_REASON
CONTROL_MODE
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DETECTED_SIZE_VERT_PIXELS
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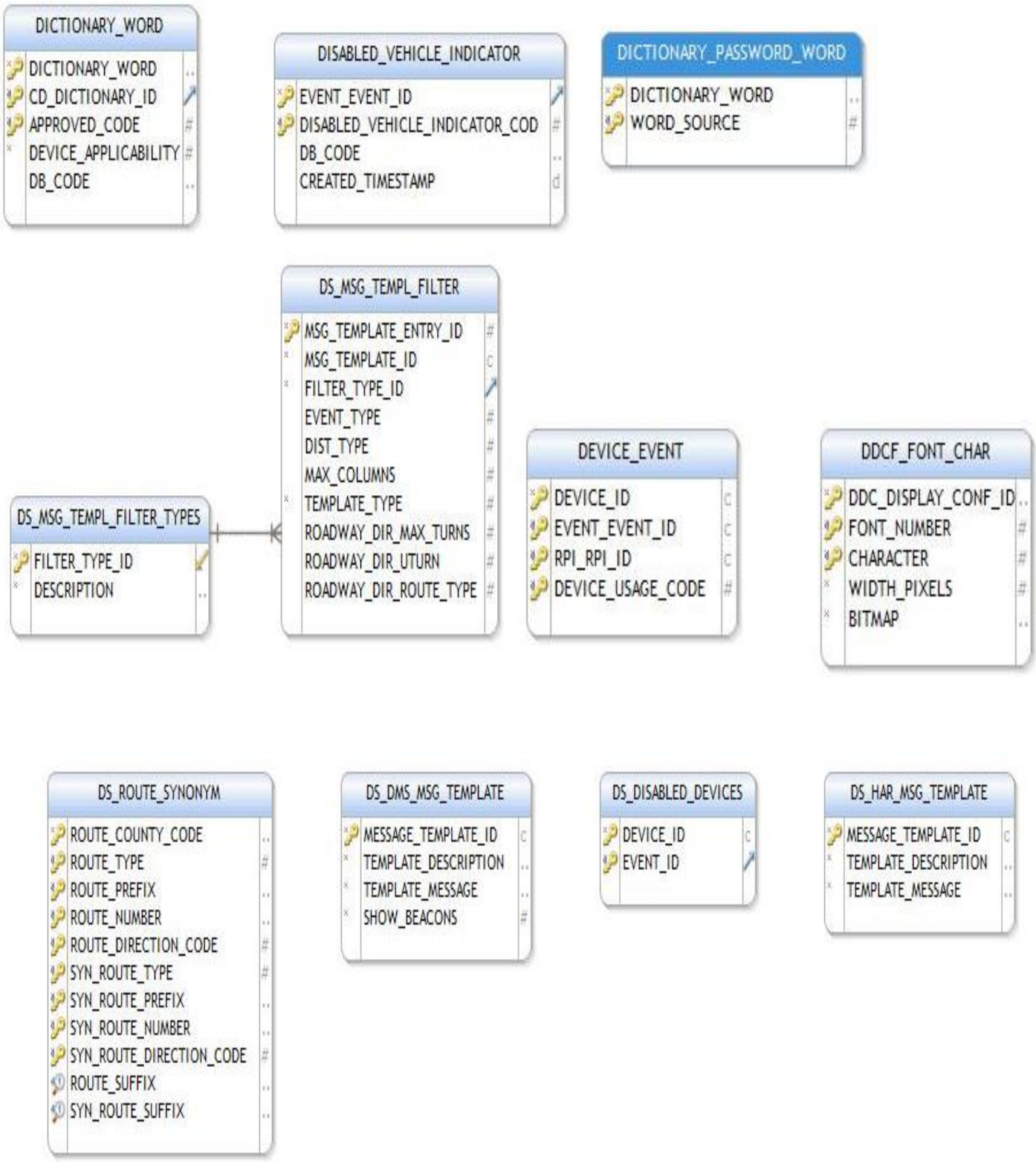
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DB_CODE
CREATED_TIMESTAMP
DICTIONARY_PASSWORD_WORD
DICTIONARY_WORD
WORD_SOURCE
DS_MSG_TEMPL_FILTER
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MSG_TEMPLATE_ID
FILTER_TYPE_ID
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DIST_TYPE
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TEMPLATE_TYPE
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ROADWAY_DIR_UTURN
ROADWAY_DIR_ROUTE_TYPE
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DDC_DISPLAY_CONF_ID
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WIDTH_PIXELS
BITMAP
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ROUTE_COUNTY_CODE
ROUTE_TYPE
ROUTE_PREFIX
ROUTE_NUMBER
ROUTE_DIRECTION_CODE
SYN_ROUTE_TYPE
SYN_ROUTE_PREFIX
SYN_ROUTE_NUMBER
SYN_ROUTE_DIRECTION_CODE
ROUTE_SUFFIX
SYN_ROUTE_SUFFIX
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MESSAGE_TEMPLATE_ID
TEMPLATE_DESCRIPTION
TEMPLATE_MESSAGE
SHOW_BEACONS
DS_DISABLED_DEVICES
DEVICE_ID
EVENT_ID
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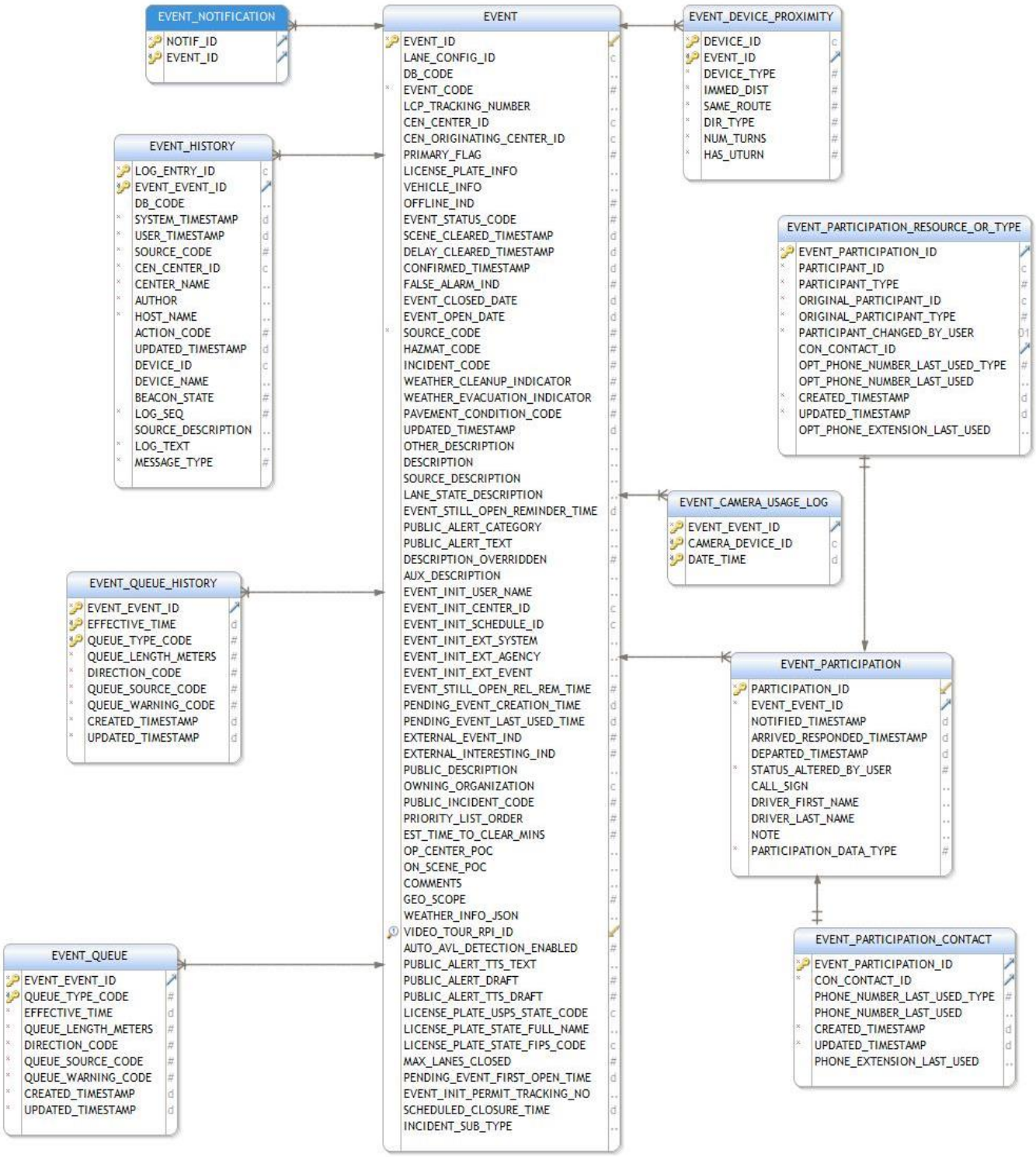
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WEATHER_EVACUATION_INDICATOR
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EVENT_INIT_SCHEDULE_ID
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PENDING_EVENT_LAST_USED_TIME
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ON_SCENE_POC
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GEO_SCOPE
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ORIGINAL_PARTICIPANT_TYPE
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UPDATED_TIMESTAMP
OPT_PHONE_EXTENSION_LAST_USED
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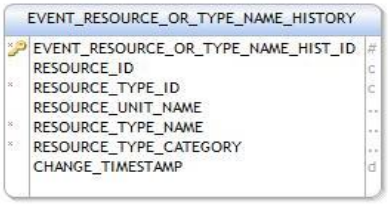
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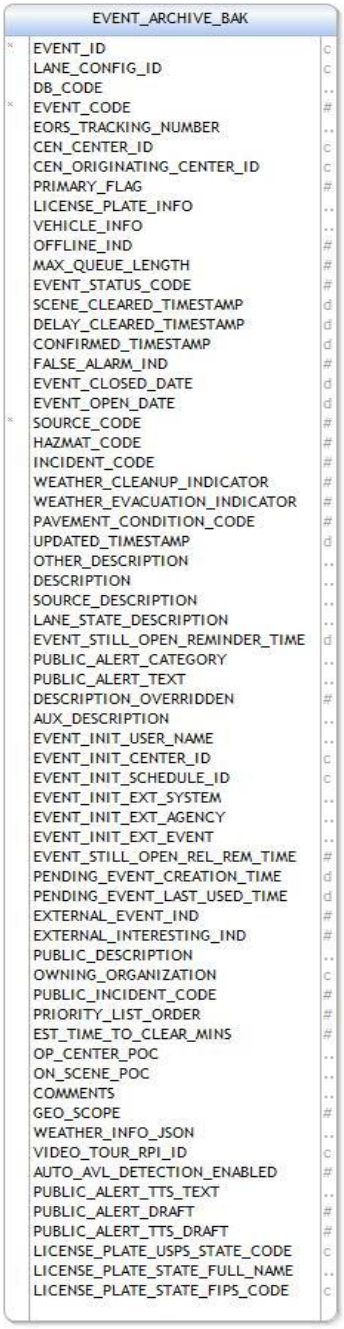
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EVENT_INIT_EXT_AGENCY
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EXTERNAL_INTERESTING_IND
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ON_SCENE_POC
COMMENTS
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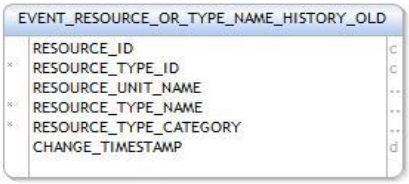
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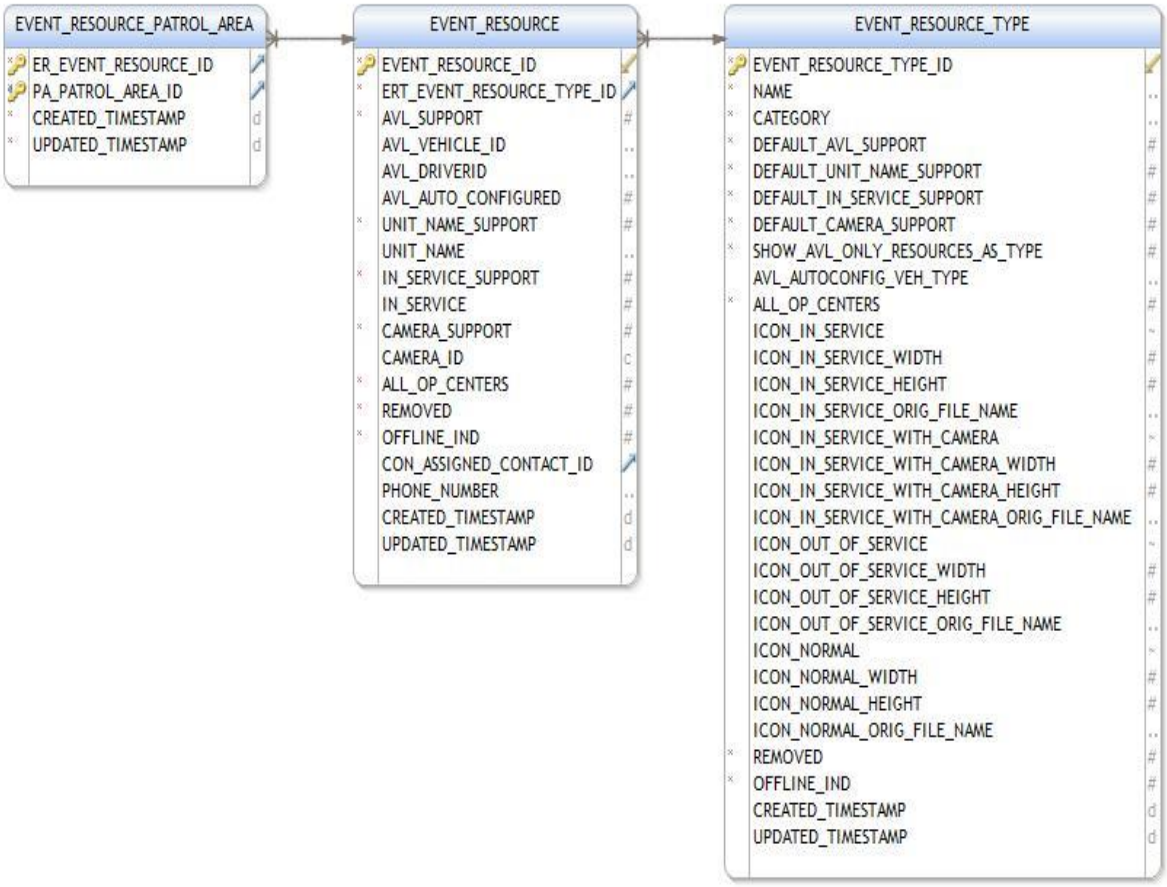
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ICON_IN_SERVICE_ORIG_FILE_NAME
ICON_IN_SERVICE_WITH_CAMERA
ICON_IN_SERVICE_WITH_CAMERA_WIDTH
ICON_IN_SERVICE_WITH_CAMERA_HEIGHT
ICON_IN_SERVICE_WITH_CAMERA_ORIG_FILE_NAME
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ICON_OUT_OF_SERVICE_WIDTH
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LONGITUDE
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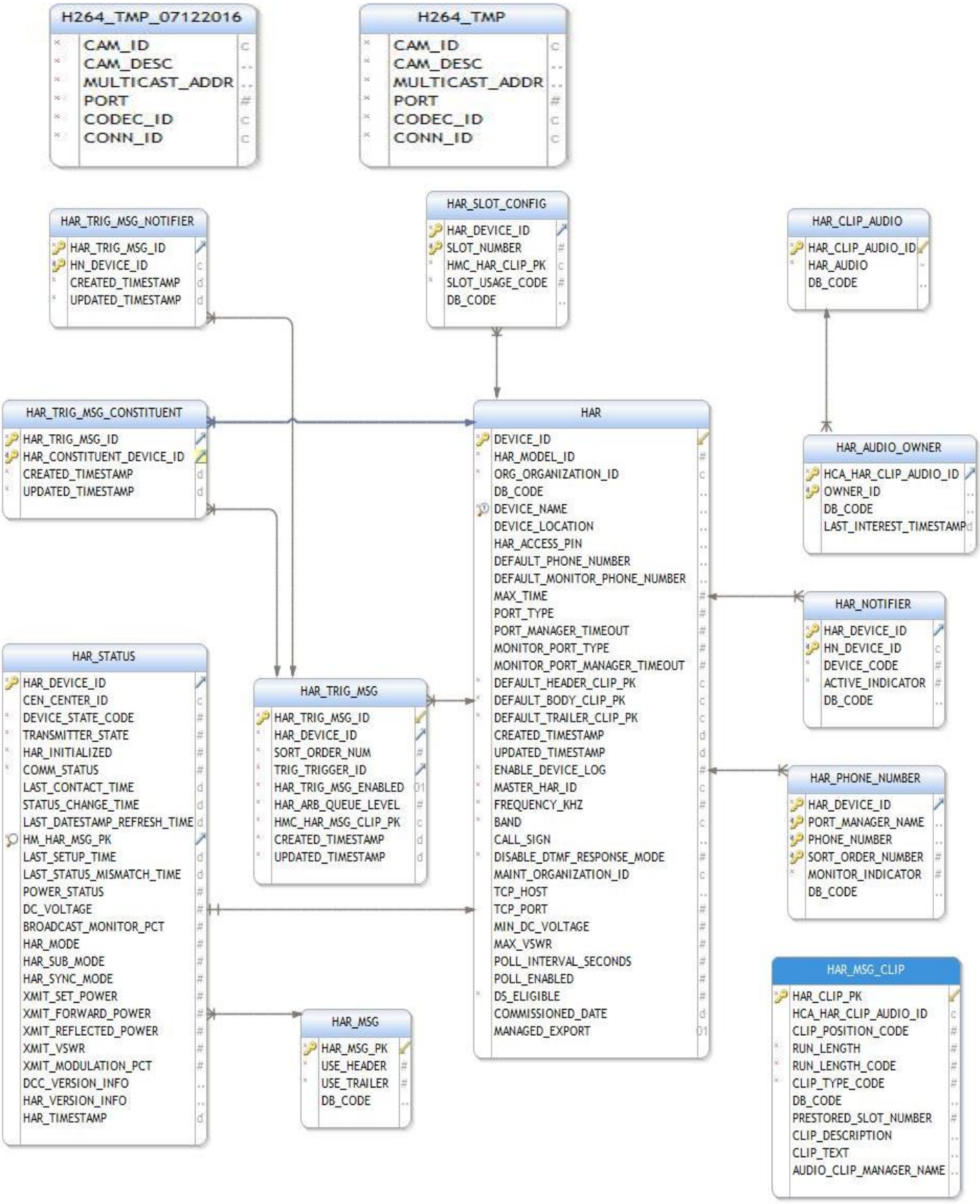
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CONN_ID
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DEFAULT_BODY_CLIP_PK
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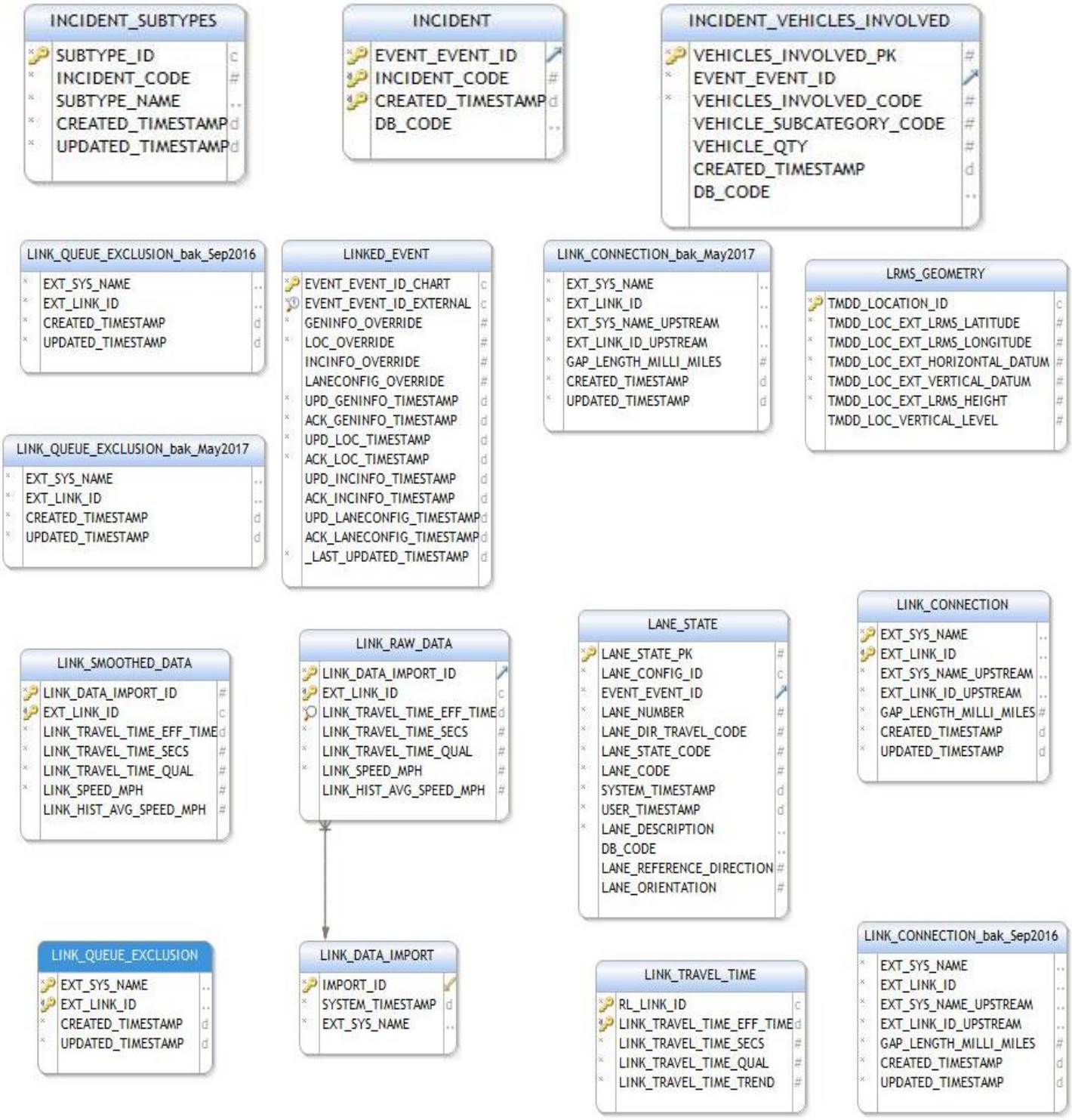
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VEHICLE_SUBCATEGORY_CODE
VEHICLE_QTY
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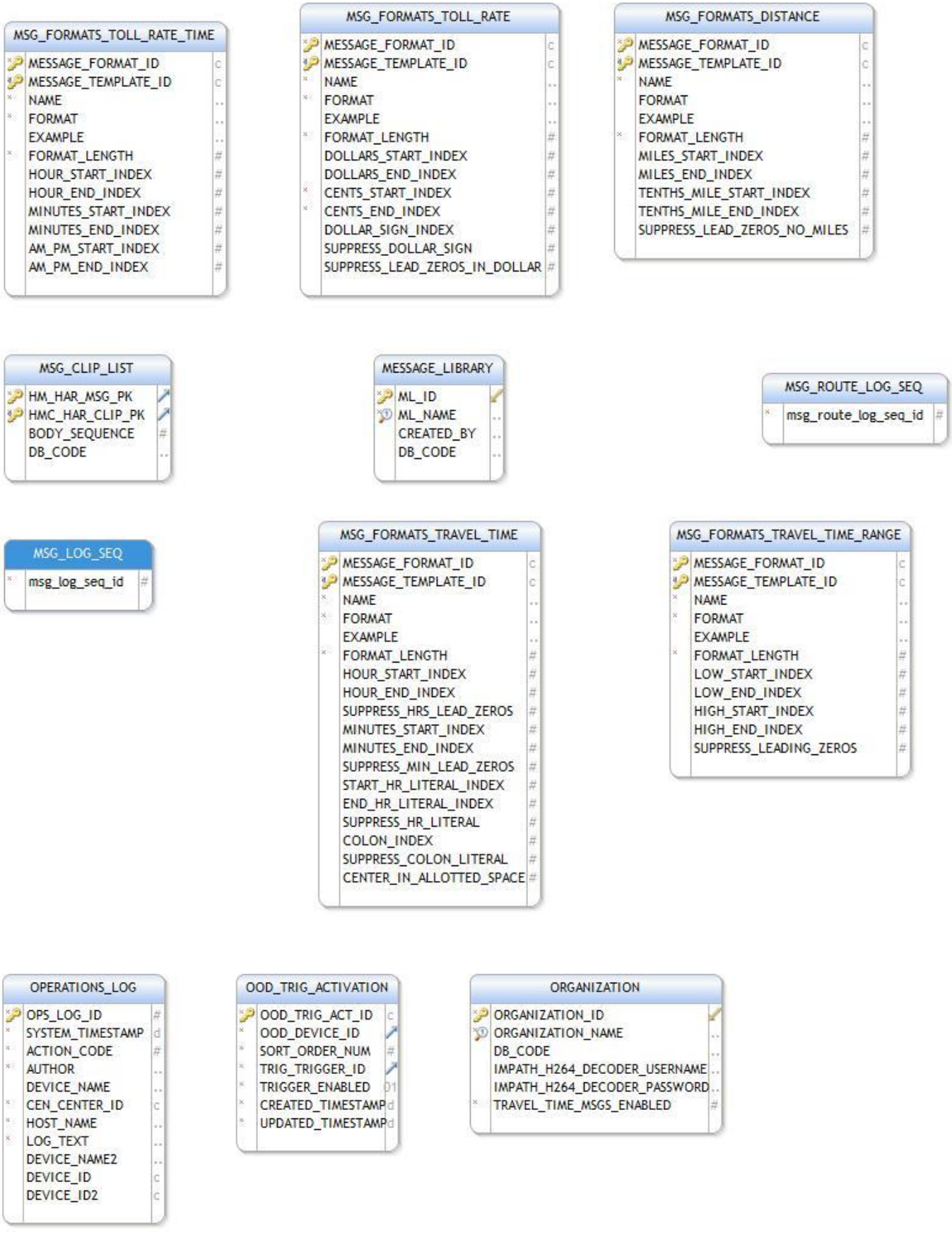
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AM_PM_END_INDEX
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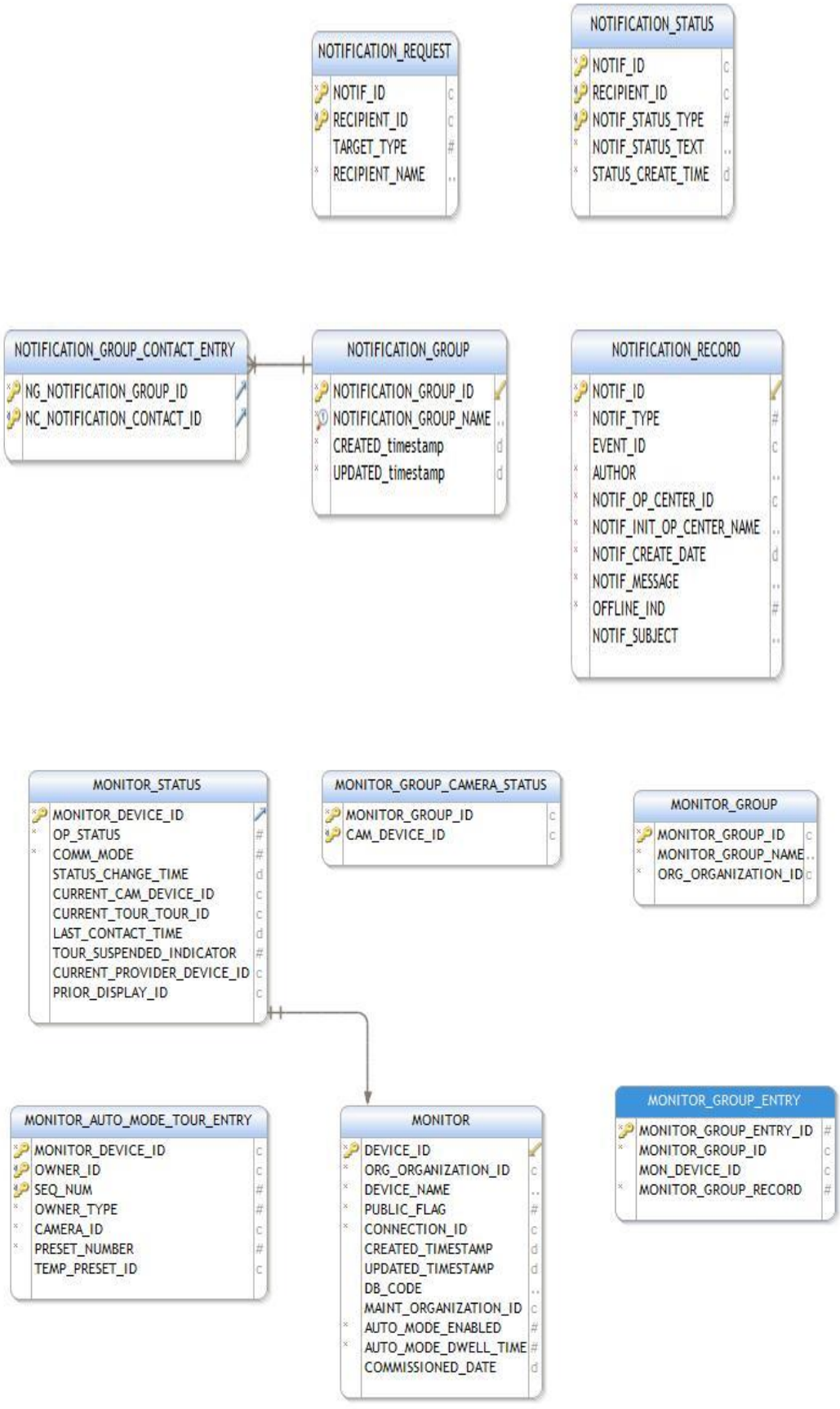
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NOTIF_SUBJECT
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PRIOR_DISPLAY_ID
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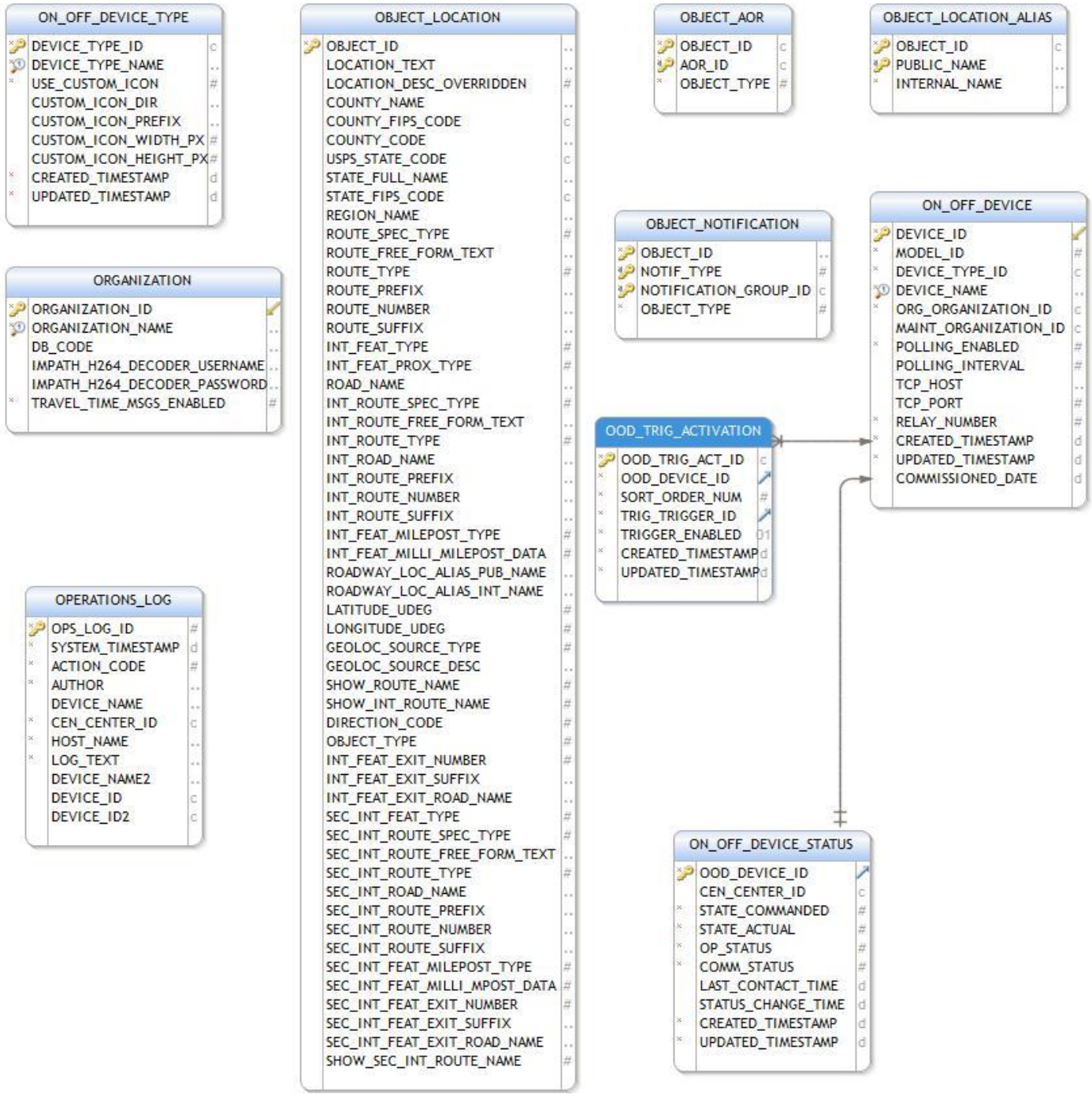
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LONGITUDE_UDEG
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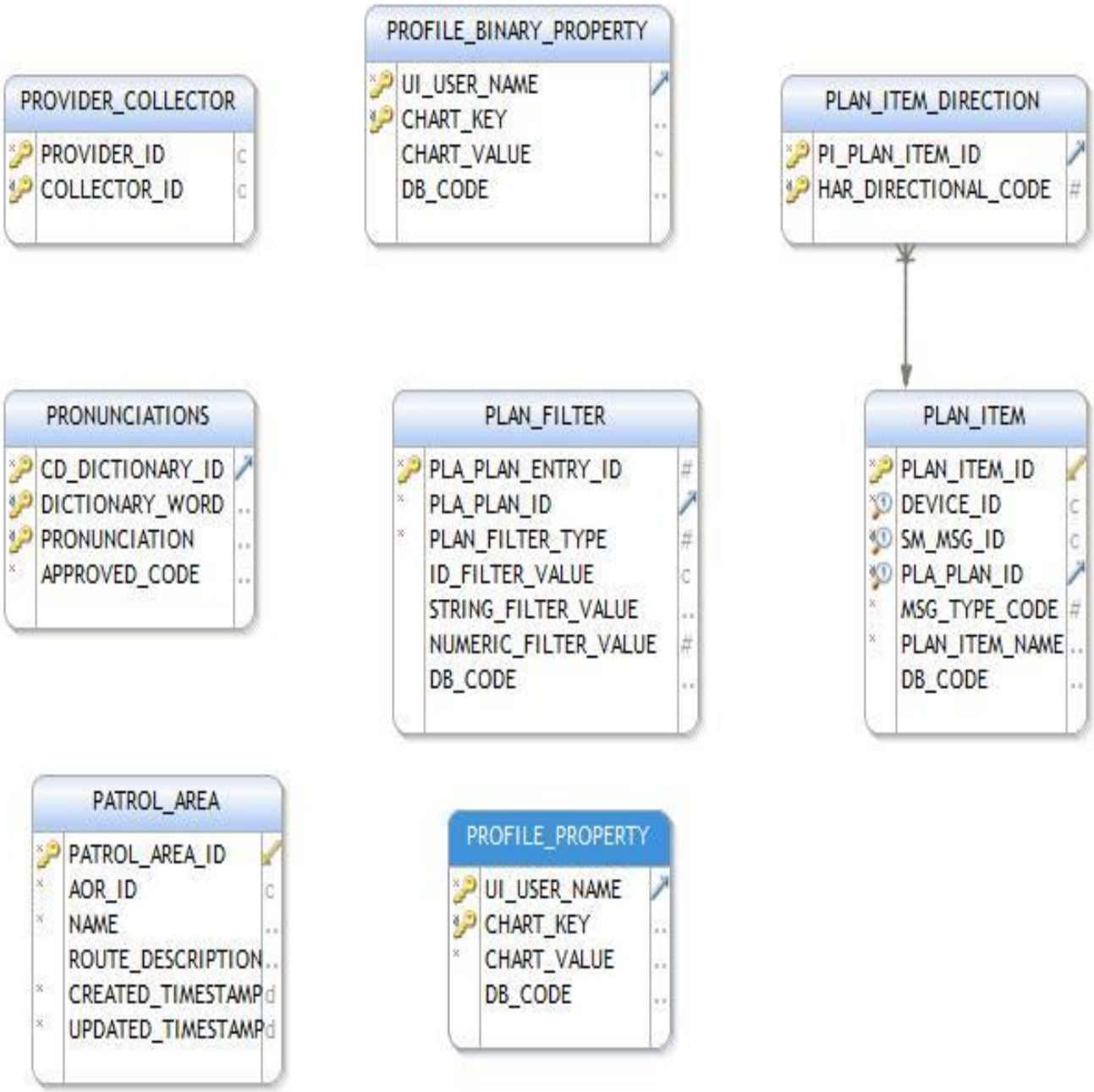
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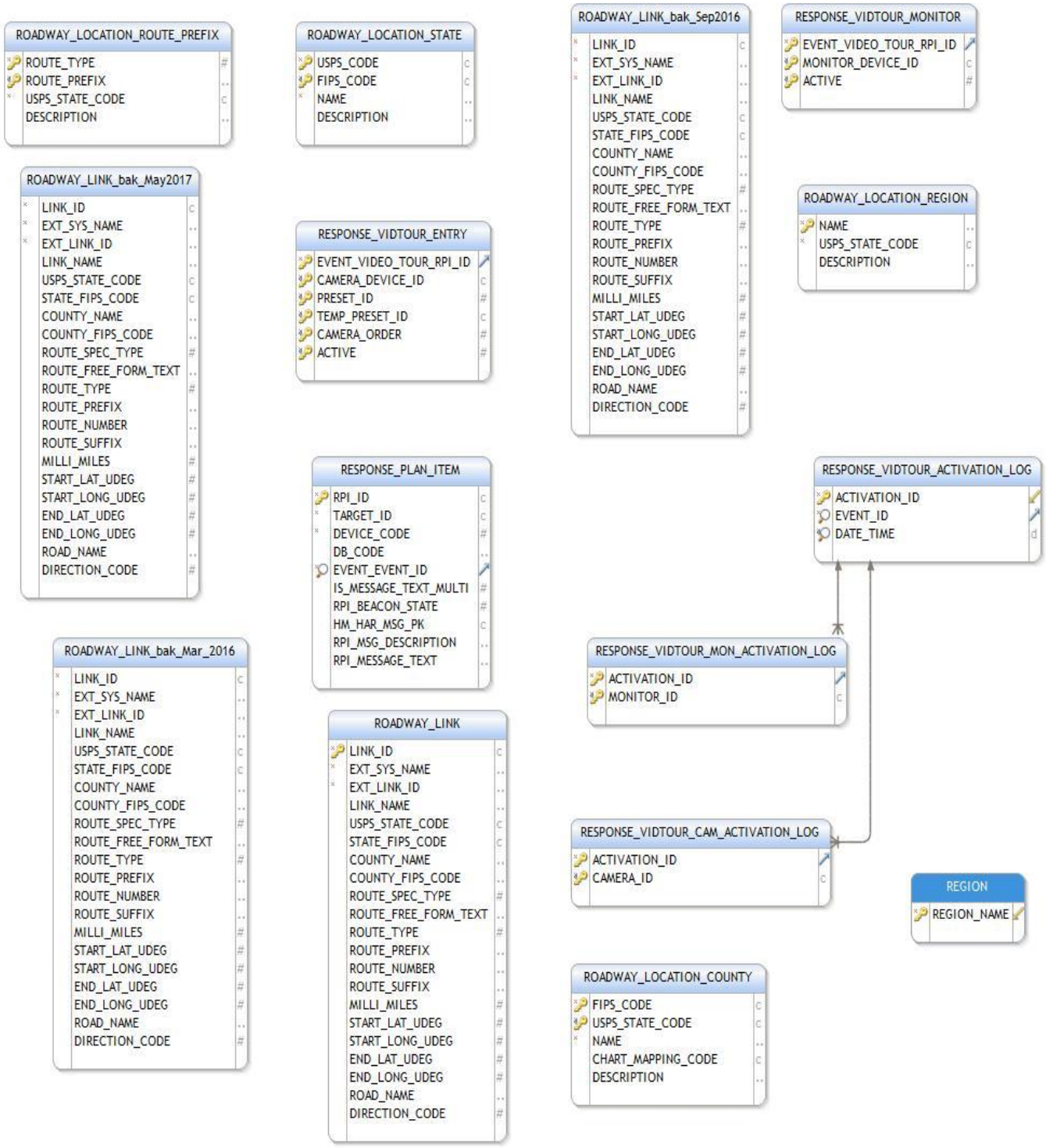
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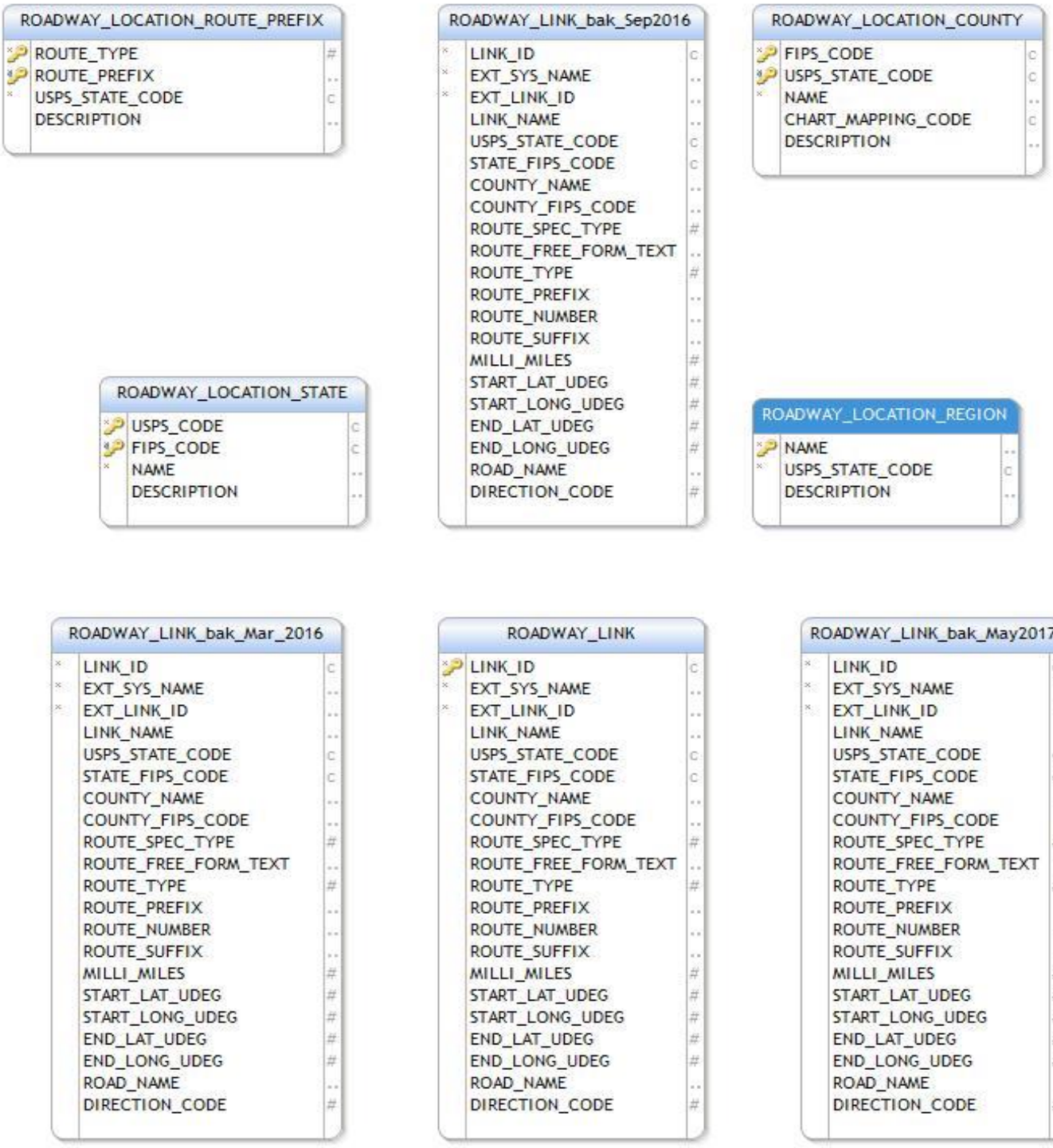
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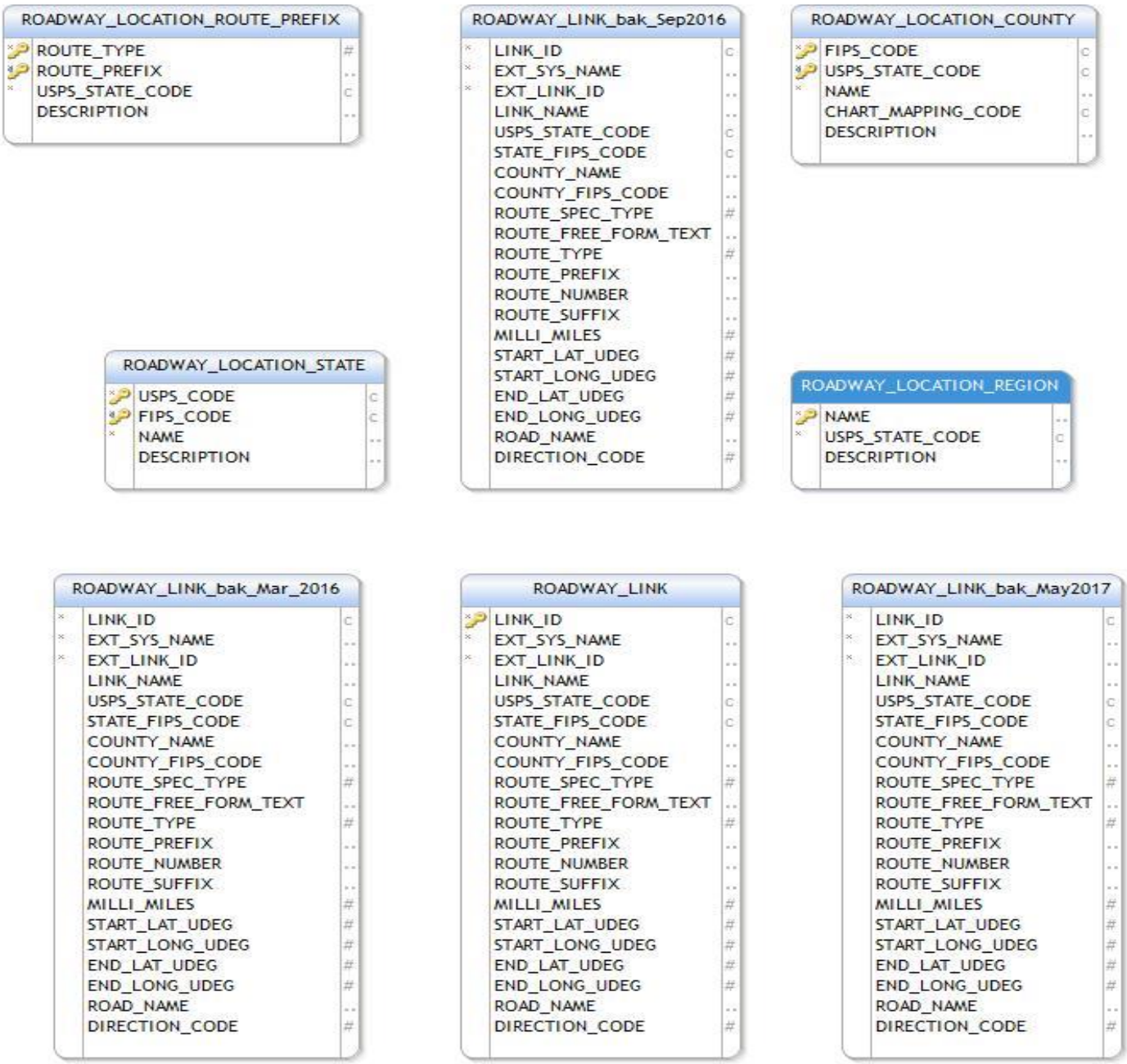
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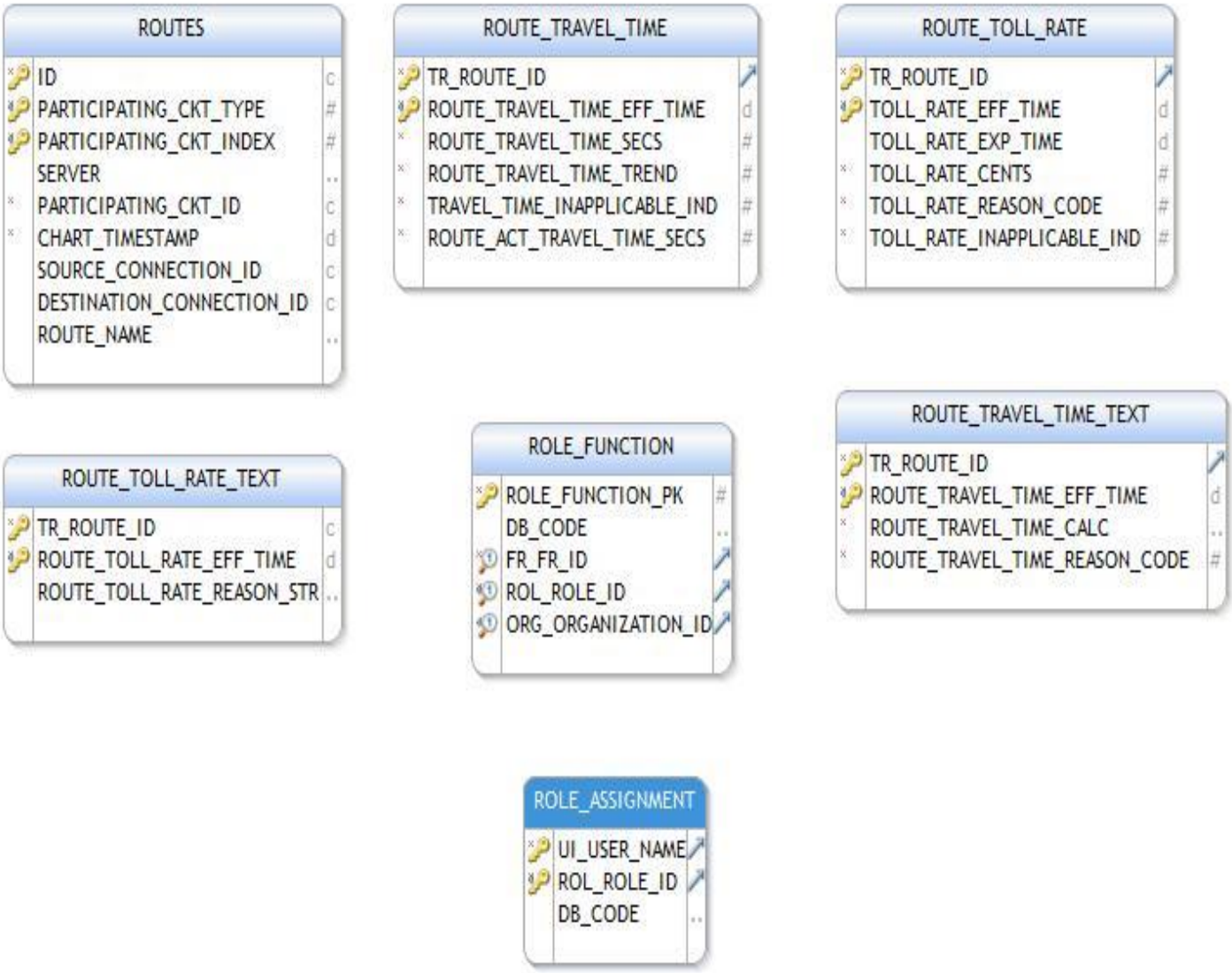
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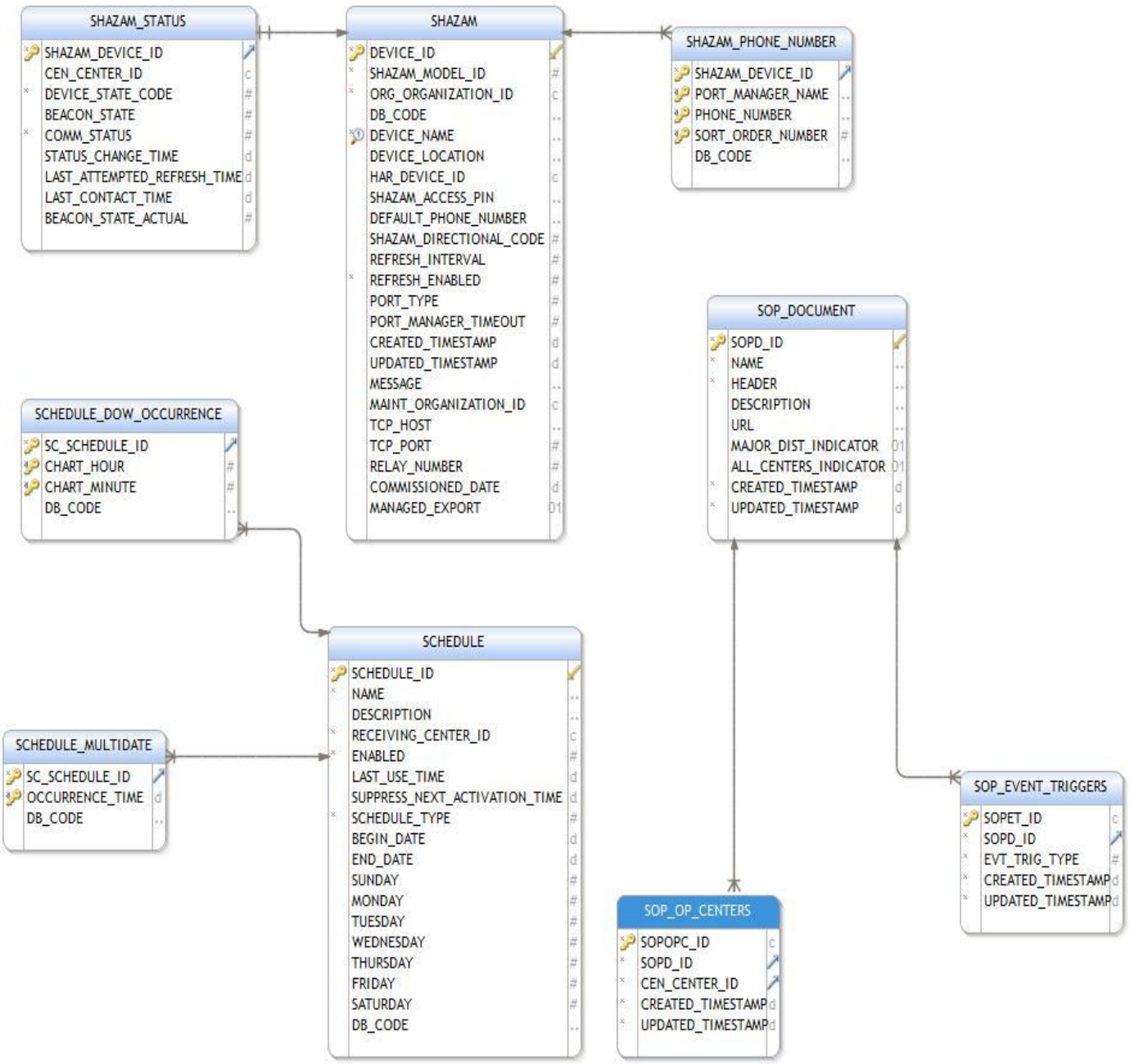
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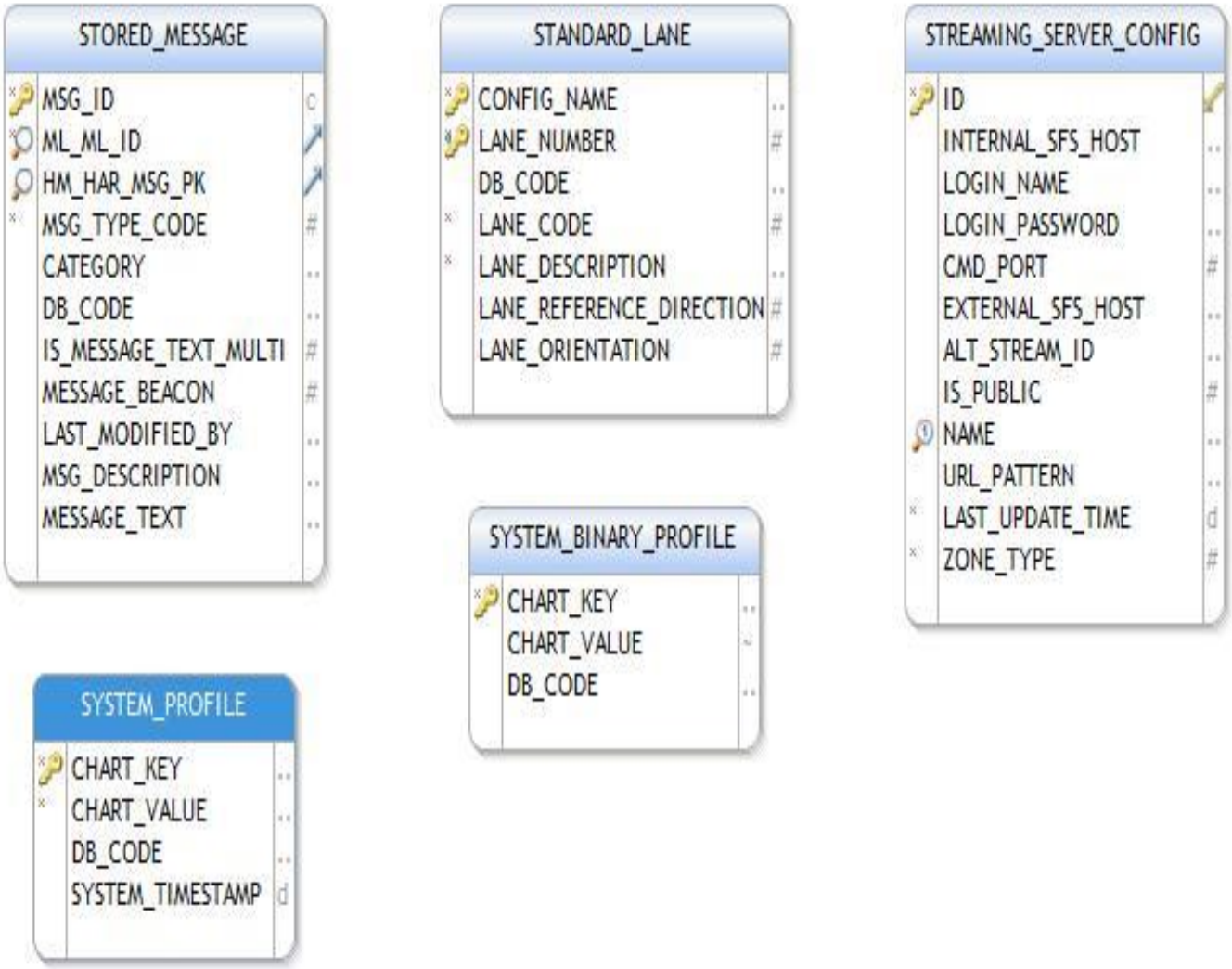
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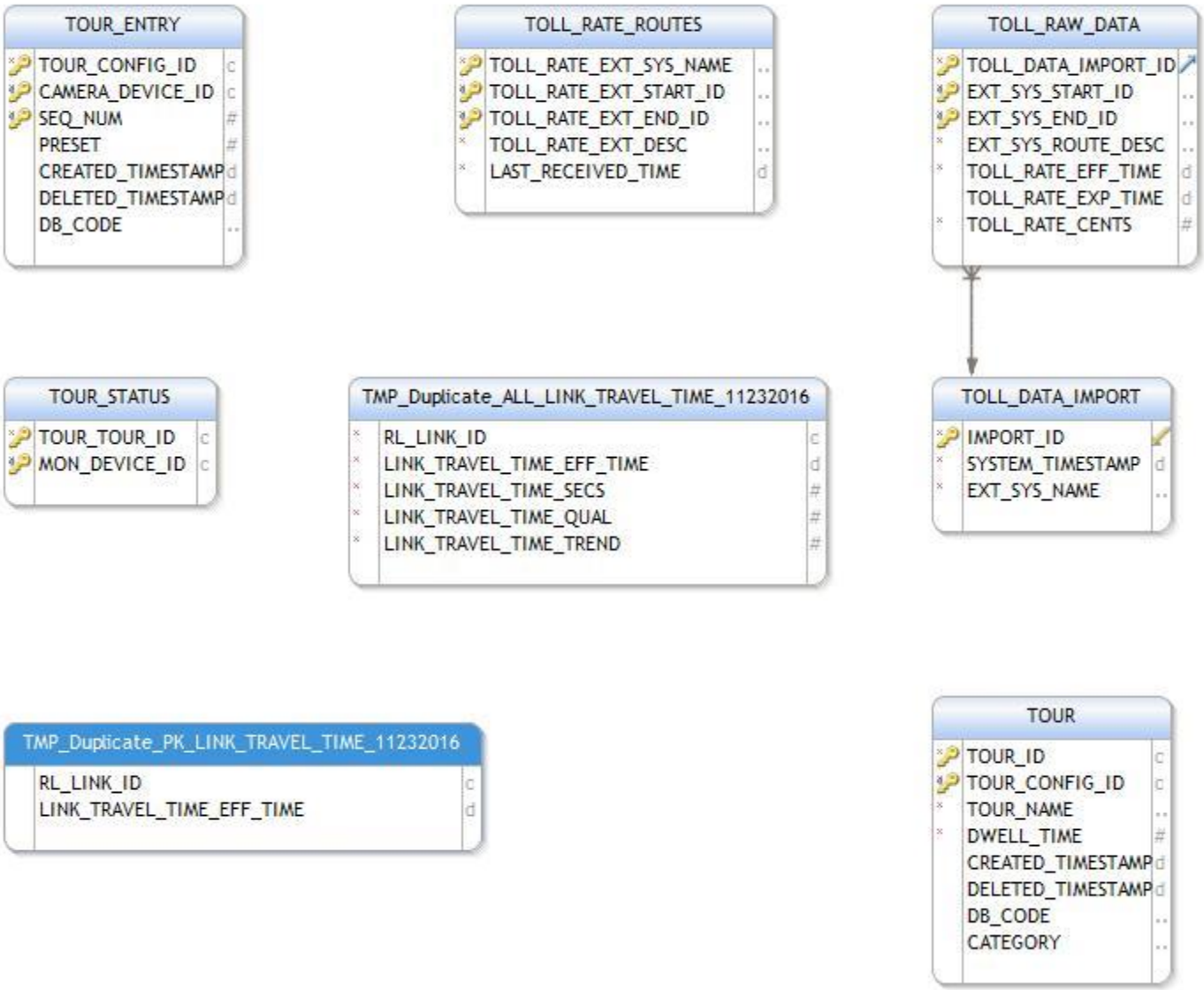
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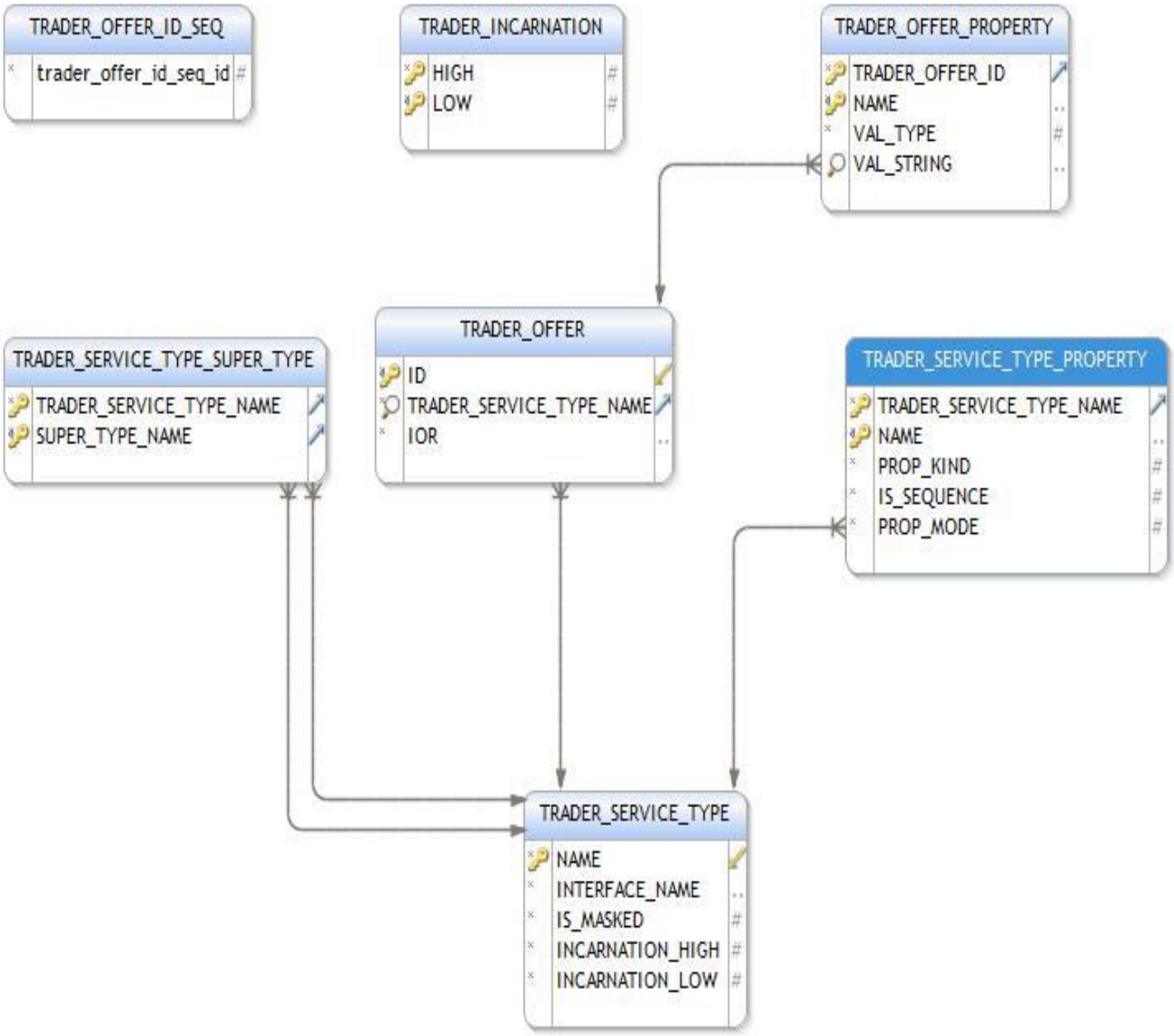
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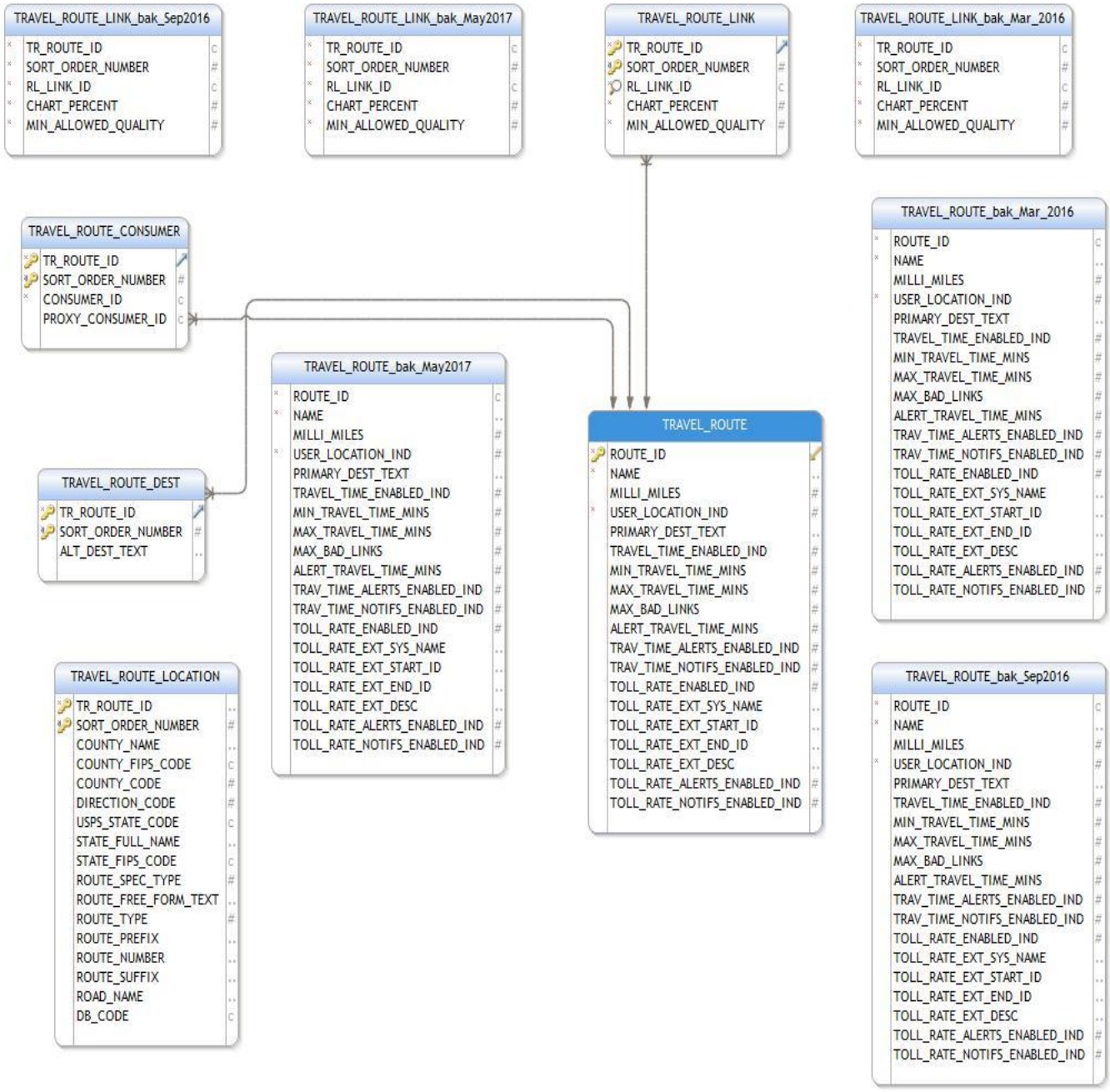
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TOLL_RATE_EXT_SYS_NAME
TOLL_RATE_EXT_START_ID
TOLL_RATE_EXT_END_ID
TOLL_RATE_EXT_DESC
TOLL_RATE_ALERTS_ENABLED_IND
TOLL_RATE_NOTIFS_ENABLED_IND
TRAVEL_ROUTE
ROUTE_ID
NAME
MILLI_MILES
USER_LOCATION_IND
PRIMARY_DEST_TEXT
TRAVEL_TIME_ENABLED_IND
MIN_TRAVEL_TIME_MINS
MAX_TRAVEL_TIME_MINS
MAX_BAD_LINKS
ALERT_TRAVEL_TIME_MINS
TRAV_TIME_ALERTS_ENABLED_IND
TRAV_TIME_NOTIFS_ENABLED_IND
TOLL_RATE_ENABLED_IND
TOLL_RATE_EXT_SYS_NAME
TOLL_RATE_EXT_START_ID
TOLL_RATE_EXT_END_ID
TOLL_RATE_EXT_DESC
TOLL_RATE_ALERTS_ENABLED_IND
TOLL_RATE_NOTIFS_ENABLED_IND
TRAVEL_ROUTE_DEST
TR_ROUTE_ID
SORT_ORDER_NUMBER
ALT_DEST_TEXT
TRAVEL_ROUTE_LOCATION
TR_ROUTE_ID
SORT_ORDER_NUMBER
COUNTY_NAME
COUNTY_FIPS_CODE
COUNTY_CODE
DIRECTION_CODE
USPS_STATE_CODE
STATE_FULL_NAME
STATE_FIPS_CODE
ROUTE_SPEC_TYPE
ROUTE_FREE_FORM_TEXT
ROUTE_TYPE
ROUTE_PREFIX
ROUTE_NUMBER
ROUTE_SUFFIX
ROAD_NAME
DB_CODE
TRAVEL_ROUTE_bak_Sep2016
ROUTE_ID
NAME
MILLI_MILES
USER_LOCATION_IND
PRIMARY_DEST_TEXT
TRAVEL_TIME_ENABLED_IND
MIN_TRAVEL_TIME_MINS
MAX_TRAVEL_TIME_MINS
MAX_BAD_LINKS
ALERT_TRAVEL_TIME_MINS
TRAV_TIME_ALERTS_ENABLED_IND
TRAV_TIME_NOTIFS_ENABLED_IND
TOLL_RATE_ENABLED_IND
TOLL_RATE_EXT_SYS_NAME
TOLL_RATE_EXT_START_ID
TOLL_RATE_EXT_END_ID
TOLL_RATE_EXT_DESC
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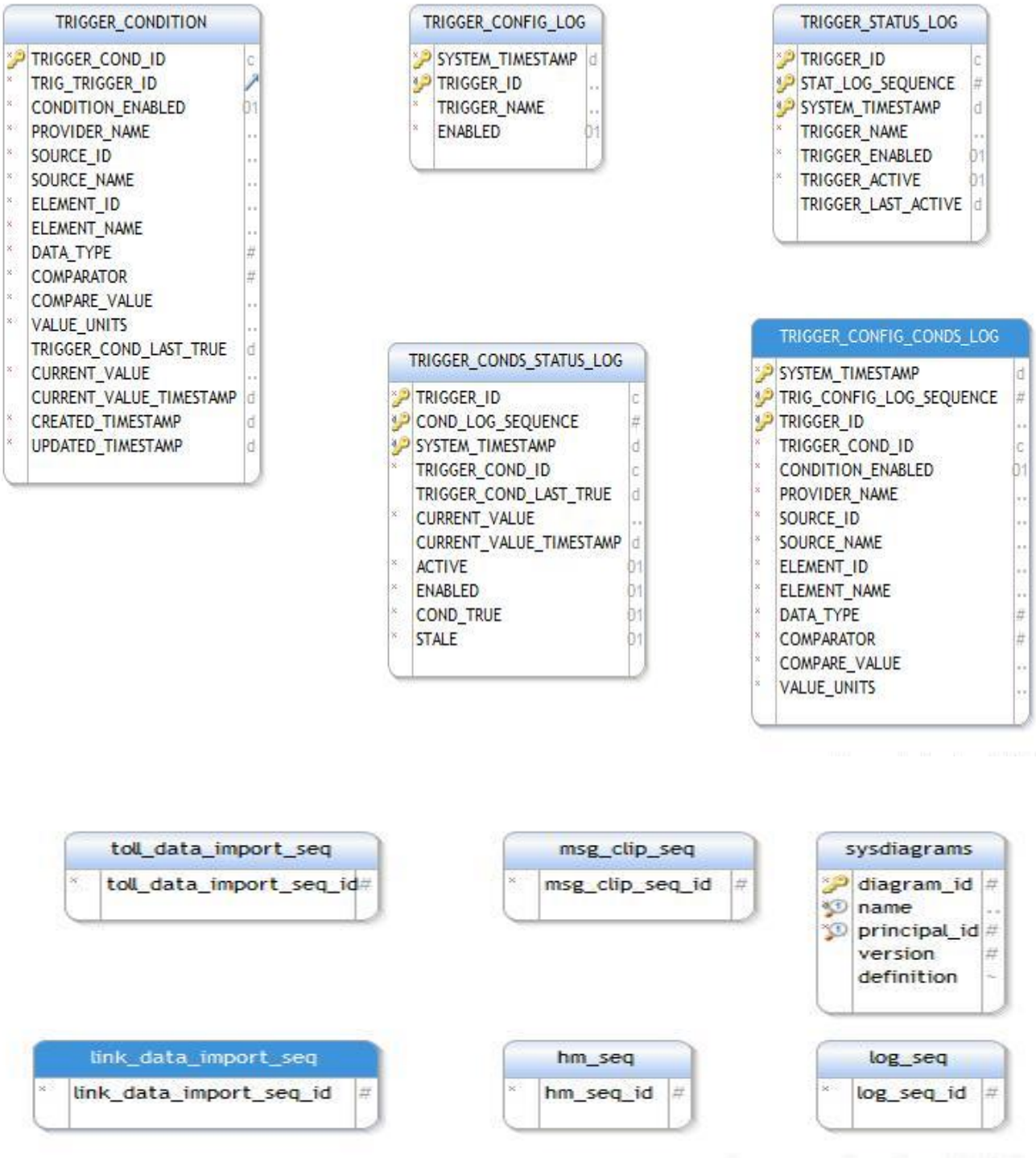
TOLL_RATE_NOTIFS_ENABLED_IND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TRIG_TRIGGER_ID
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PROVIDER_NAME
SOURCE_ID
SOURCE_NAME
ELEMENT_ID
ELEMENT_NAME
DATA_TYPE
COMPARATOR
COMPARE_VALUE
VALUE_UNITS
TRIGGER_COND_LAST_TRUE
CURRENT_VALUE
CURRENT_VALUE_TIMESTAMP
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
TRIGGER_CONFIG_LOG
SYSTEM_TIMESTAMP
TRIGGER_ID
TRIGGER_NAME
ENABLED
TRIGGER_STATUS_LOG
TRIGGER_ID
STAT_LOG_SEQUENCE
SYSTEM_TIMESTAMP
TRIGGER_NAME
TRIGGER_ENABLED
TRIGGER_ACTIVE
TRIGGER_LAST_ACTIVE
TRIGGER_CONDS_STATUS_LOG
TRIGGER_ID
COND_LOG_SEQUENCE
SYSTEM_TIMESTAMP
TRIGGER_COND_ID
TRIGGER_COND_LAST_TRUE
CURRENT_VALUE
CURRENT_VALUE_TIMESTAMP
ACTIVE
ENABLED
COND_TRUE
STALE
TRIGGER_CONFIG_CONDS_LOG
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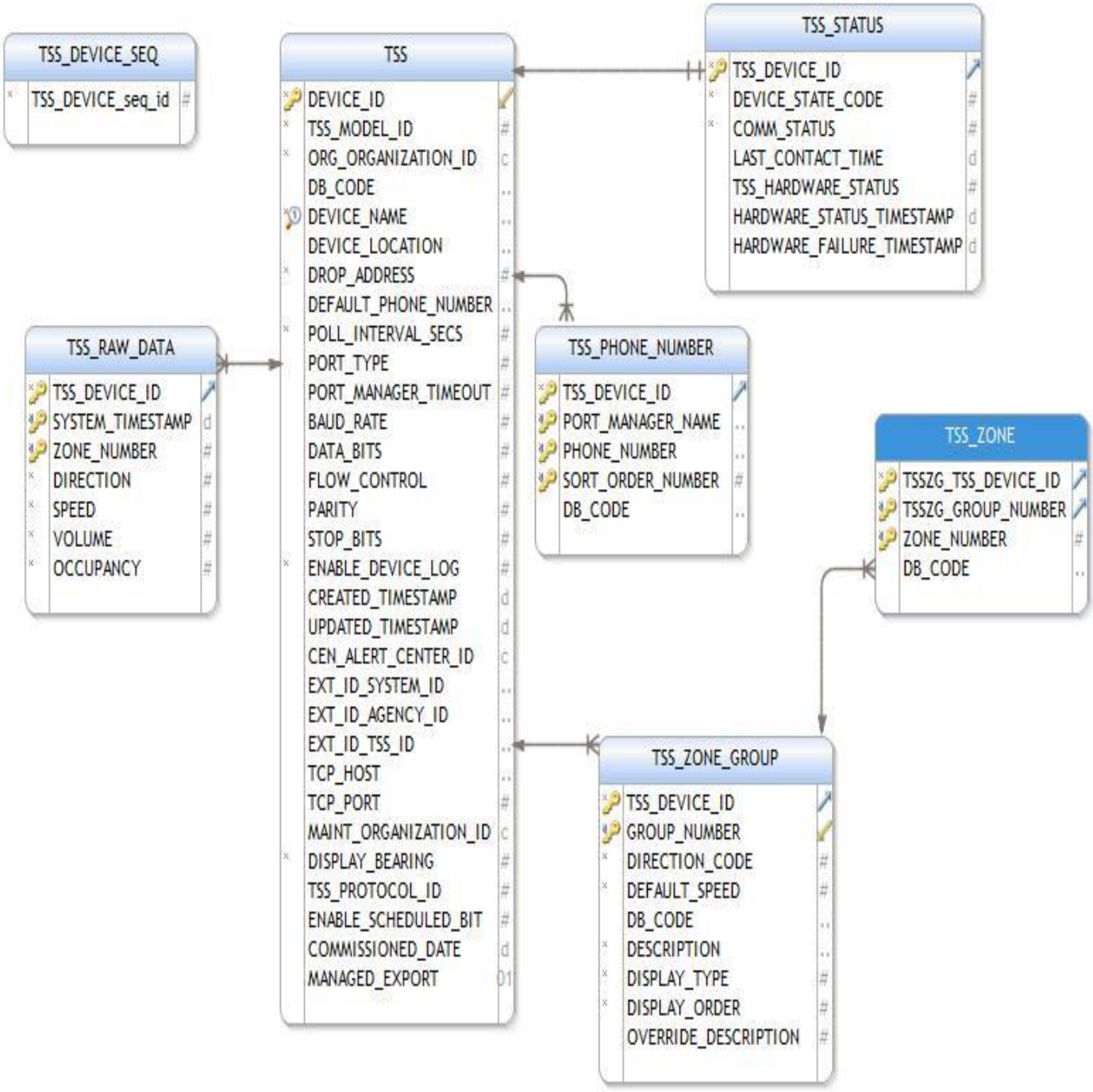
TRIG_CONFIG_LOG_SEQUENCE
TRIGGER_ID
TRIGGER_COND_ID
CONDITION_ENABLED
PROVIDER_NAME
SOURCE_ID
SOURCE_NAME
ELEMENT_ID
ELEMENT_NAME
DATA_TYPE
COMPARATOR
COMPARE_VALUE
VALUE_UNITS
toll_data_import_seq
toll_data_import_seq_id
msg_clip_seq
msg_clip_seq_id
sysdiagrams
diagram_id
name
principal_id
version
definition
link_data_import_seq
link_data_import_seq_id
hm_seq
hm_seq_id
log_seq
log_seq_id


TSS_DEVICE_SEQ
TSS_DEVICE_seq_id
TSS
DEVICE_ID
TSS_MODEL_ID
ORG_ORGANIZATION_ID
DB_CODE
DEVICE_NAME
DEVICE_LOCATION
DROP_ADDRESS
DEFAULT_PHONE_NUMBER
POLL_INTERVAL_SECS
PORT_TYPE
PORT_MANAGER_TIMEOUT
BAUD_RATE
DATA_BITS
FLOW_CONTROL
PARITY
STOP_BITS
ENABLE_DEVICE_LOG
CREATED_TIMESTAMP
UPDATED_TIMESTAMP
CEN_ALERT_CENTER_ID
EXT_ID_SYSTEM_ID
EXT_ID_AGENCY_ID
EXT_ID_TSS_ID
TCP_HOST
TCP_PORT
MAINT_ORGANIZATION_ID
DISPLAY_BEARING
TSS_PROTOCOL_ID
ENABLE_SCHEDULED_BIT
COMMISSIONED_DATE
MANAGED_EXPORT
TSS_STATUS
TSS_DEVICE_ID
DEVICE_STATE_CODE
COMM_STATUS
LAST_CONTACT_TIME
TSS_HARDWARE_STATUS
HARDWARE_STATUS_TIMESTAMP
HARDWARE_FAILURE_TIMESTAMP
TSS_RAW_DATA
TSS_DEVICE_ID
SYSTEM_TIMESTAMP
ZONE_NUMBER
DIRECTION
SPEED
VOLUME
OCCUPANCY
TSS_PHONE_NUMBER
TSS_DEVICE_ID
PORT_MANAGER_NAME
PHONE_NUMBER
SORT_ORDER_NUMBER
DB_CODE
TSS_ZONE
TSSZG_TSS_DEVICE_ID
TSSZG_GROUP_NUMBER
ZONE_NUMBER
DB_CODE
TSS_ZONE_GROUP
TSS_DEVICE_ID
GROUP_NUMBER
DIRECTION_CODE
DEFAULT_SPEED
DB_CODE
DESCRIPTION
DISPLAY_TYPE
DISPLAY_ORDER
OVERRIDE_DESCRIPTION

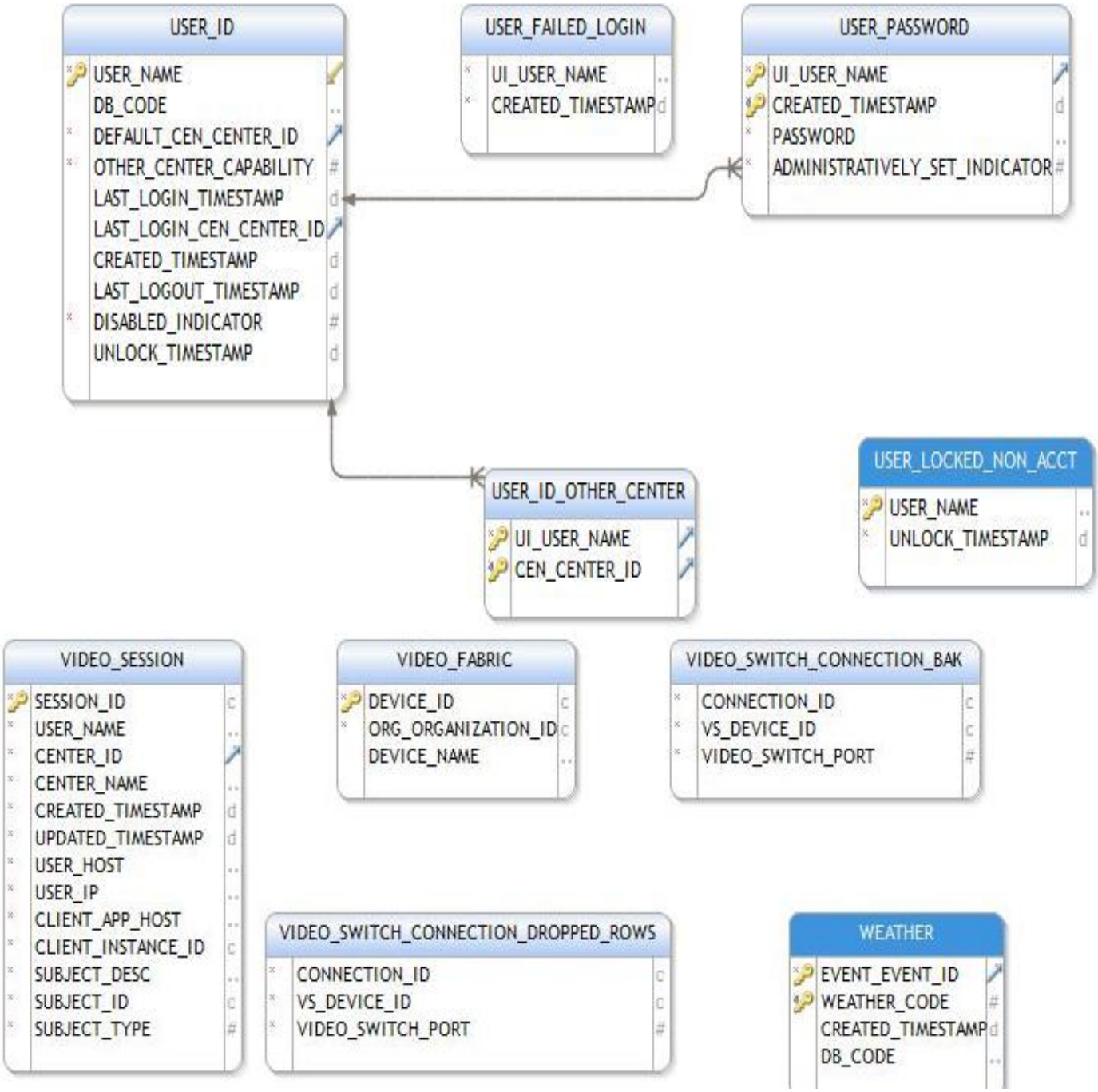


Figure 3-2. CHART_Live ERD

Appendix B CHART Archive Database Entity Relationship Diagram (ERD)

There were no changes to the CHART_Archive database schema for R18.

Appendix C Function to Entity Matrix Report

The Create, Retrieve, Update, Delete (CRUD) matrix cross-references business functions to entities and shows the use of the entities by those functions. This report is generated as part of the CHART O&M Guide.

Appendix D Table Definition Report –

In tables shown below:

- Deleted columns/constraints marked with a minus sign ("-")
- Modified columns/constraints marked with an asterisk ("*")
- New columns/constraints marked with a plus sign ("+")

Appendix A Database Changes for ATMS-887 NTCIP DMS: Consider Skipping FontStatus Check on Per DMS Basis

3.1.1.2.1.1.A.1 CHART ATMS DB

DMS Table:

Column Name	**Type**	**Size**	**Nullable**
DEVICE_ID	CHAR	32	NO
DMS_MODEL_ID	NUMERIC	NULL	NO
ORG_ORGANIZATION_ID	CHAR	32	NO
DB_CODE	VARCHAR	1	YES
DEVICE_NAME	VARCHAR	15	NO
HAR_DEVICE_ID	CHAR	32	YES
COMM_LOSS_TIMEOUT	NUMERIC	NULL	NO
DROP_ADDRESS	NUMERIC	NULL	NO
INITIAL_RESPONSE_TIMEOUT	NUMERIC	NULL	NO
BEACON_TYPE	NUMERIC	NULL	YES
SIGN_TYPE	NUMERIC	NULL	YES
DEFAULT_PHONE_NUMBER	VARCHAR	25	YES
POLL_INTERVAL	NUMERIC	NULL	NO
POLLING_ENABLED	NUMERIC	NULL	NO
PORT_TYPE	NUMERIC	NULL	YES
PORT_MANAGER_TIMEOUT	NUMERIC	NULL	YES
BAUD_RATE	NUMERIC	NULL	YES
DATA_BITS	NUMERIC	NULL	YES
FLOW_CONTROL	NUMERIC	NULL	YES
PARITY	NUMERIC	NULL	YES

STOP_BITS	NUMERIC	NULL	YES
ENABLE_DEVICE_LOG	NUMERIC	NULL	NO
VMS_CHARACTER_HEIGHT_PIXELS	NUMERIC	NULL	YES
VMS_CHARACTER_WIDTH_PIXELS	NUMERIC	NULL	YES
VMS_MAX_PAGES	NUMERIC	NULL	YES
VMS_SIGN_HEIGHT_PIXELS	NUMERIC	NULL	YES
VMS_SIGN_WIDTH_PIXELS	NUMERIC	NULL	YES
CREATED_TIMESTAMP	DATETIME2	NULL	YES
UPDATED_TIMESTAMP	DATETIME2	NULL	YES
SHAZAM_BEACON_STATE	NUMERIC	NULL	NO
SHAZAM_IS_MESSAGE_TEXT_MULTI	NUMERIC	NULL	NO
DMS_SHAZAM_MSG	VARCHAR	1024	YES
COMMUNITY_STRING	VARCHAR	16	YES
TRAVEL_TIME_QUEUE_LEVEL	NUMERIC	NULL	YES
TOLL_RATE_QUEUE_LEVEL	NUMERIC	NULL	YES
OVERRIDE_SCHEDULE_IND	NUMERIC	NULL	YES
ENABLED_SPECIFIC_TIMES_IND	NUMERIC	NULL	YES
TCP_HOST	VARCHAR	16	YES
TCP_PORT	NUMERIC	NULL	YES
EXT_ID_SYSTEM_ID	VARCHAR	35	YES
EXT_ID_AGENCY_ID	VARCHAR	35	YES
EXT_ID_DMS_ID	VARCHAR	256	YES
HDLC_FRAME_REQUIRED	NUMERIC	NULL	YES
MAINT_ORGANIZATION_ID	CHAR	32	YES
DDC_DMS_DISPLAY_CONF_ID	CHAR	32	NO
DS_ELIGIBLE	NUMERIC	NULL	NO
COMMISSIONED_DATE	DATE	NULL	YES
MANAGED_EXPORT	BIT	NULL	YES
+NTCIP_FONT_MGMT_OPTION	TINYINT	NULL	YES

Appendix B Database Changes for ATMS-2523 Incorporate Skyline/Turnkey RVDS-based Decoder into ATMS

3.1.1.2.1.1.B.1 CHART ATMS DB

CODEC Table:

Column Name	Type	Size	Nullable
CODEC_ID	CHAR	32	NO
CONNECTION_MODEL_TYPE	NUMERIC	3	NO

CODEC_HOST	VARCHAR	16	NO
CODEC_COMMAND_PORT	NUMERIC	5	NO
CODEC_VIDEO_PORT	NUMERIC	1	YES
+RVDS_MAC_ADDR	CHAR	17	YES
+RVDS_VIRT_MON_NUM	TINYINT	3	YES

+CODEC_STREAMING_SERVER Table:

Column Name	Type	Size	Nullable
+CODEC_ID	CHAR	32	NO
+SSC_ID	CHART	32	NO

3.1.1.2.1.2 Database Conversion

There are no data conversion / migration tasks identified for CHART ATMS R18.

3.1.1.2.1.3 PL/SQL Module Definition and Database Trigger Reports

There are no new PL/SQL modules for CHART ATMS R18.

3.1.1.2.1.4 Database Size Estimate - provides size estimate of current design

CHART ATMS R18 does not materially affect the size of the CHART ATMS database. Details are as follows:

- *ATMS-887 NTCIP DMS: Consider Skipping FontStatus Check on Per DMS Basis*. This adds one byte of storage (four bytes of disk space) for each of about 400 DMSs, adding less than 2K to the CHART_Live database size, and no additional size to the CHART_Archive DB.
- *ATMS-2523 Incorporate Skyline/Turnkey RVDS-based Decoder into ATMS.* This adds two bytes of storage (four bytes of disk space) for each of about 300 monitors, plus 64 bytes for each of an estimated 20 RVDS Monitors, totaling less than 3K added to the CHART_Live database size, with no additional size added to the CHART_Archive DB.

3.1.1.2.1.5 Data Distribution

There are no changes to data distribution for R18.

3.1.1.2.1.6 Database Replication

Database replication is not used in R18.

Appendix E Database Failover Strategy

There are no changes to the database failover strategy for R18.

Appendix F Reports

Since R5, the CHART reporting function has been transferred to University of Maryland and is beyond the scope of this document.

3.2 Non-Database Management System Files

The following describes any updates to application data files (used for input or output), that are non-DBMS.

3.2.1 ATMS

The following describes the use of flat files in CHART ATMS.

3.2.1.1 Service Registration Files

There are no changes to service registration files for CHART ATMS R18.

3.2.1.2 Service Property Files

Service property files are organized the same for CHART ATMS R18 as previously. (There are no new property files, though various changes are necessary for some of the files.)

3.2.1.3 GUI Property Files

The GUI properties file is located in the WEB-INF directory for CHART ATMS R18. There are various changes to the properties defined therein.

3.2.1.4 Device Logs

There are no changes to Device Log Files for CHART ATMS R18.

3.2.1.5 Service Process Logs

All CHART ATMS services write to a process log, used to provide a historical record of activity undertaken by the services. These logs are occasionally referenced by software engineering personnel to diagnose a problem or reconstruct a sequence of events leading to a particular anomalous situation. These logs are automatically deleted by the system after a set period of time defined by the service's properties file, so they do not accumulate infinitely. These files are stored in the individual service directories and are named by the service name and date, plus a ".txt" extension. These logs are typically read only by software engineering personnel. There are no changes to the organization of service process log files for CHART ATMS R18.

3.2.1.6 Service Error Logs

All CHART ATMS services write to an error log, used to provide detail on certain errors encountered by the services. Most messages, including most errors, are captured by the CHART ATMS software and written to the process logs, but certain messages (typically produced by the Java Virtual Machine itself, by COTS, or DLLs) cannot be captured by CHART ATMS Software and instead are captured in these "catch-all" logs. Errors stored in these logs are typically problems resulting from a bad installation; once the system is up and running, errors rarely appear in these error logs. Debugging information from the JacORB COTS, which is not usually

indicative of errors, can routinely be found in these error logs, as well. These log files can be reviewed by software engineering personnel to diagnose an installation problem or other type of problem. These logs are automatically deleted by the system after a set period of time defined by the service's properties file, so they do not accumulate infinitely. These files are stored in the individual service directories and are named by the service name and date, plus an ".err" extension. These logs are typically read only by software engineering personnel. There are no changes for service error logs for R18 features.

3.2.1.7 GUI Process Logs

Like the CHART background services, the CHART ATMS GUI service also writes to a process log file, used to provide a historical record of activity undertaken by the process. These GUI process logs are occasionally referenced by software engineering personnel to diagnose a problem or reconstruct a sequence of events leading to a particular anomalous situation. These logs are automatically deleted by the system after a set period of time defined by the GUI service's properties file, so they do not accumulate infinitely. These files are stored in the chartlite/LogFiles/ directory under the WebApps/ directory in the Apache Tomcat installation area. They are named by the service name ("chartlite") and date, plus a ".txt" extension. These logs are typically read only by software engineering personnel. Additional log files written by the Apache Tomcat system itself are stored in the log/ directory in the Apache Tomcat installation area.

- The CHART ATMS R18 GUI changes do not change the way the GUI process logs operate.

3.2.1.8 FMS Port Configuration Files

The CHART ATMS Communications Services read a Port Configuration file, typically named PortConfig.xml, upon startup, which indicates which ports are to be used by the service and how they are to be initialized. A Port Configuration Utility is provided which allows for addition, removal of ports and editing of initialization parameters. As indicated by the extension, these files are in XML format. This means these files are hand-editable, although the Port Configuration Utility allows for safer, more controlled editing. The Port Configuration files are typically modified only by software engineers or telecommunications engineers.

- There are no changes to this section for the any of the CHART ATMS R18 features.

3.2.1.9 Watchdog Configuration Files

The Watchdog service uses XML configuration files to specify what actions to take for each ATMS service. There are no changes to the Watchdog configuration files for CHART ATMS R18.

4 HUMAN-MACHINE INTERFACE

4.1 Home Page Events – Flash Replacement

This section describes the updates in R18 for removal of Flash from the Events List tab of the Home Page in the CHART GUI.

4.1.1 Events List Display.

This section describes the display of Events list on the Home Page and comprises work done in the following PR.

- ATMS-2377: Flash – Home Page – Events Lists – Display Event Lists.

The display of the Home Page Events List differs from the previous R17 Flash-based version with the addition of a Show Entries and Paging controls. The Show Entries control allows the user to select a specific number of Events to display within the current window before the remainder are displayed on subsequent pages. The increments provided are 5, 8, 10, 50, 100, or All with the All case displaying all Events (in a given event type tab) on a single page. The default of 5 Events displayed initially. See below Figure 4-1 - 4.9

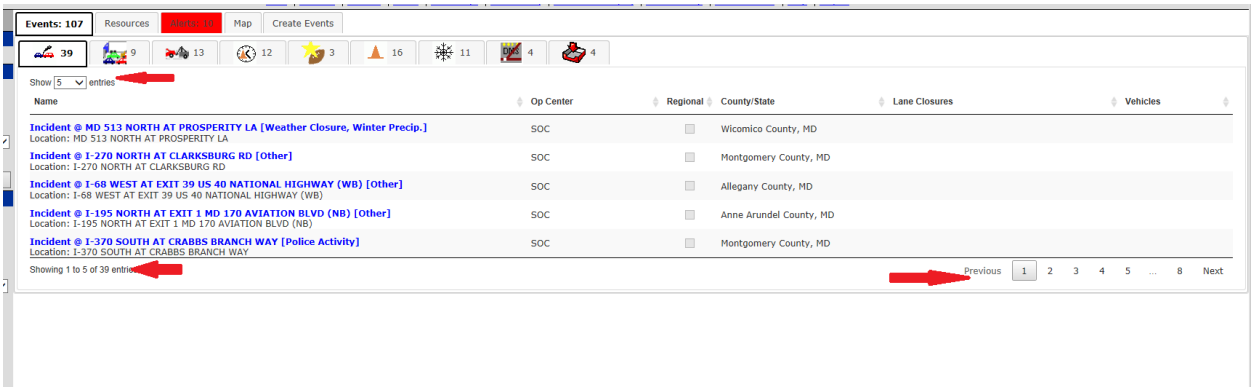


Figure 4-1 Events Tab – Initial Incident Events Tab

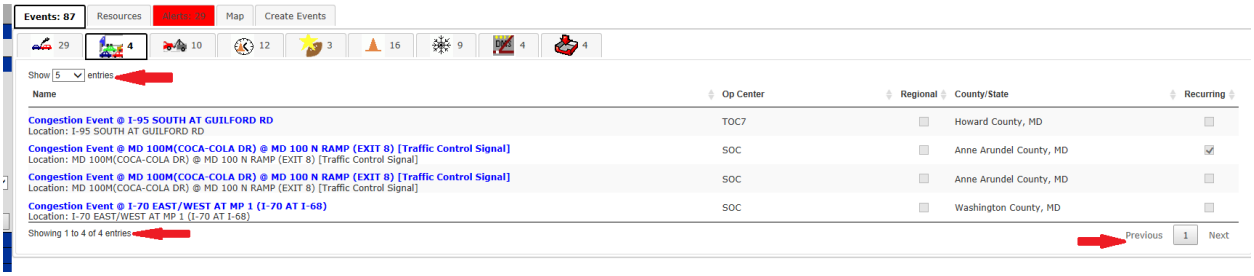


Figure 4-2 Events Tab – Initial Congestion Events Tab

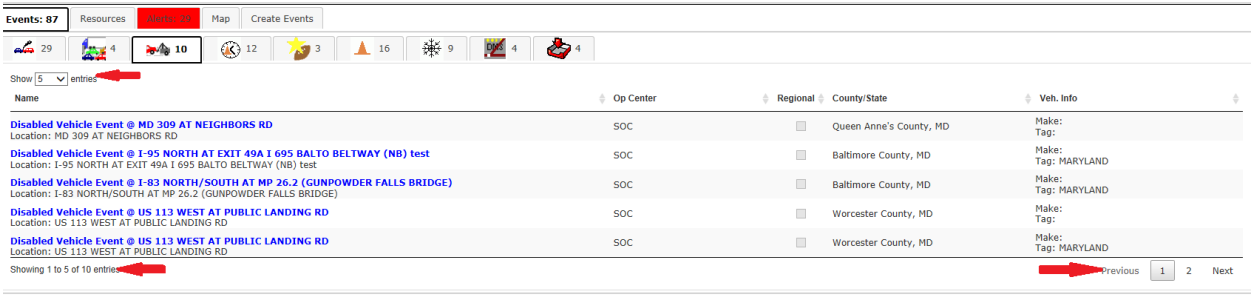


Figure 4-3 Events Tab – Initial Disabled Vehicle Events Tab

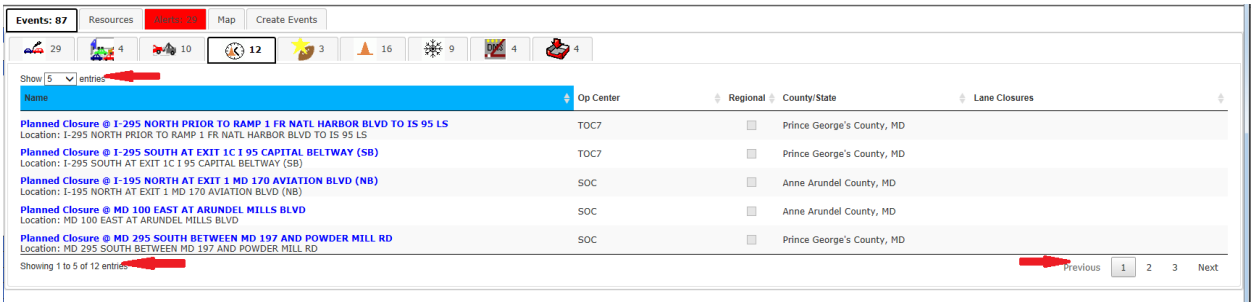


Figure 4-4 Events Tab – Initial Planned Closure Events Tab

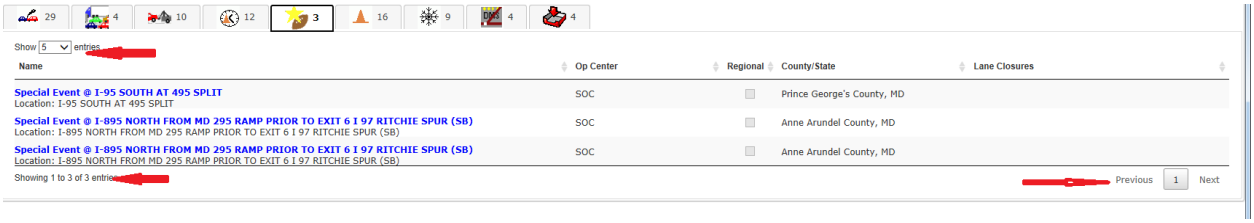


Figure 4-5 Events Tab – Initial Special Events Tab

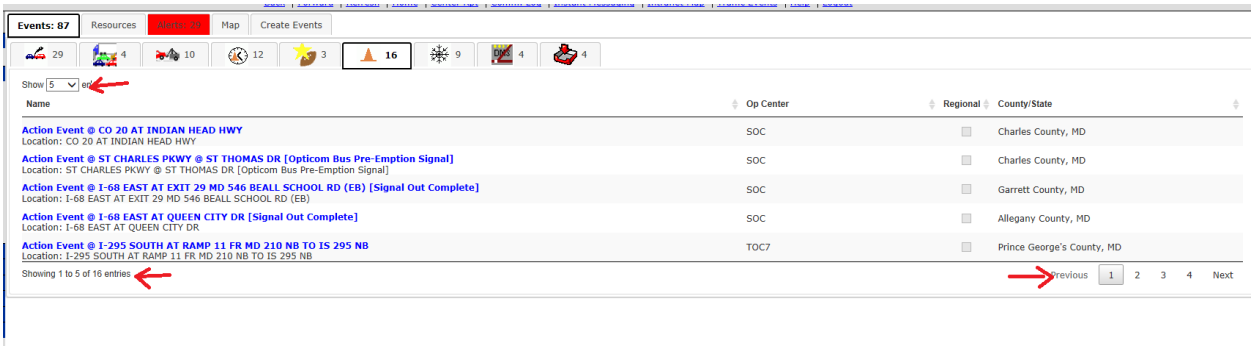


Figure 4-6 Events Tab – Initial Action Events Tab

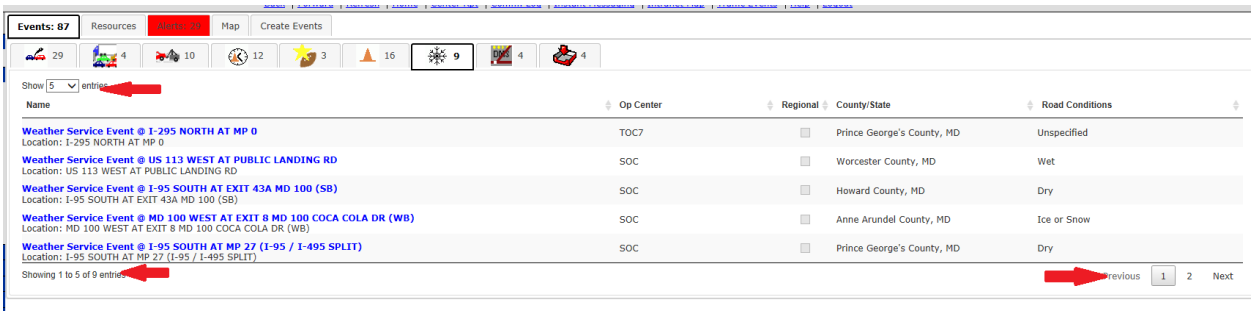


Figure 4-7 Events Tab – Initial Weather Service Events Tab

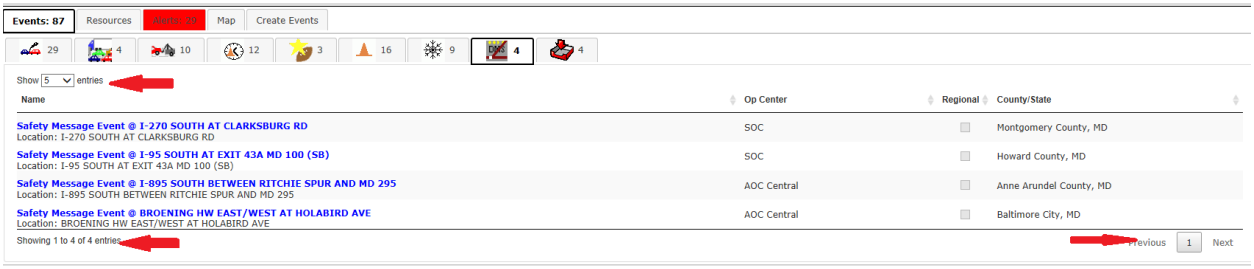


Figure 4-8 Events Tab – Initial Safety Message Events Tab

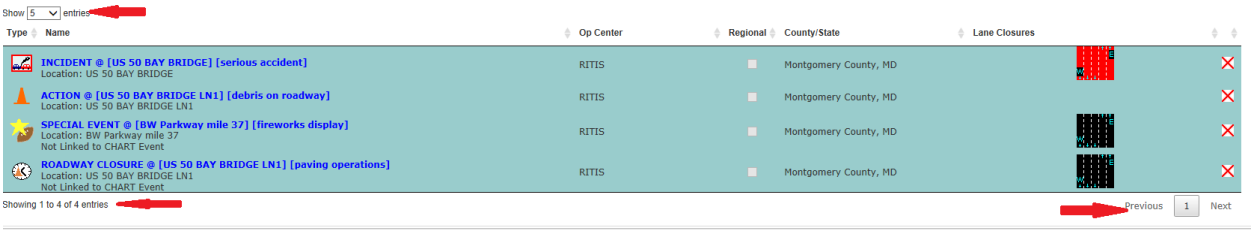


Figure 4-9 Events Tab – Initial External Events Tab

Summary of existing functionality:

- Events tab heading includes a total number of events in all the sub-tabs, excluding External Events tab.
- When hovered on the Events tab, will display the total number of Events in the tab.
- All the sub-tabs under Events tab contain an image of the event type and a current number of events in the tab.
- When a CHART event is linked to External Event, the label will be displayed to indicate that the event is linked to an external event, and the indicator is shaded with a light green background. Columns that are showing data supplied by the external event will be shaded with a light green background, and columns that showing data supplied by CHART system will have a white background as shown in Figure 4-10.

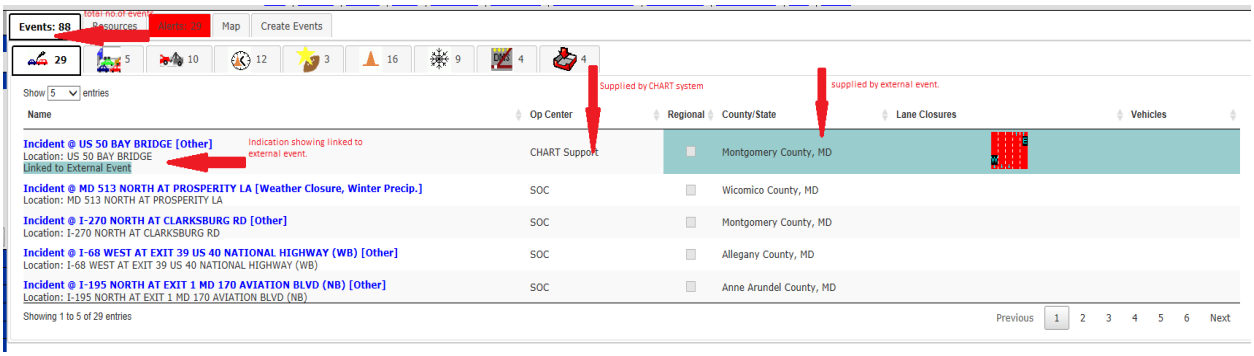


Figure 4-10 CHART Events linked to External Events

- If data has changed in the external system in any of the linked event sections, an indicator will show the event is updated and the first column will have a yellow as shown in the Figure 4-11.

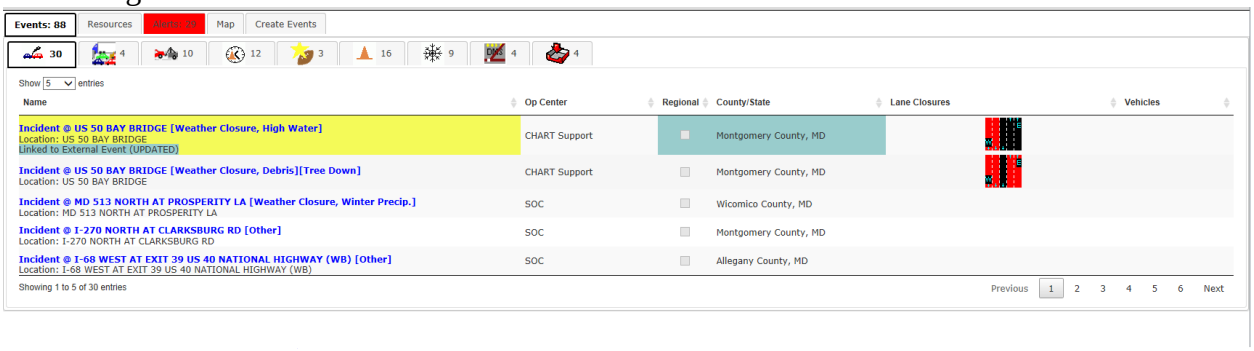


Figure 4-11 CHART Events linked to External Events Updated Info.

- Event names are clickable to view either the event details page or the event summary page - depending on the user's rights.
- Hovering on the incidents tab shows the total number of incidents in the tab; all other tabs just show the name of the event type.
- Hovering on the Lane closure image displays the summary of lanes closed.
- The external event tab shows external events of all types so the event type icon is included for clarity. Hovering on the icon displays the type of event in the CHART system.
- Hovering on the X in the external event tab displays the value of the Interesting/Not Interesting flag

4.1.2 Removing External Event from the Events List.

This section describes the removal of External Event from Events list on the Home Page and comprises work done in the following PR.

- ATMS-2378: Flash – Home Page – Event Lists – Set Interesting Flag.

Summary of existing functionality:

- Only External Events marked as “Interesting” will show in the external event sub-tab of the Home page. The tab will contain a number that indicates the number of external events that appear in the tab.
- If the user has been granted the proper right, an X will appear in the right-hand column, for each external event; the X represents the Interesting Flag as shown in Figure 4-12.
- When clicked on the X of an event, it will remove the event from the list of “interesting” external events. The external event will remain in the system, but because clicking the X removes the “Interesting” flag, it will no longer appear on the homepage.
- By removing the event from the events section of the Home page, the number displayed on external event tab will get updated to a current number of events in the tab.

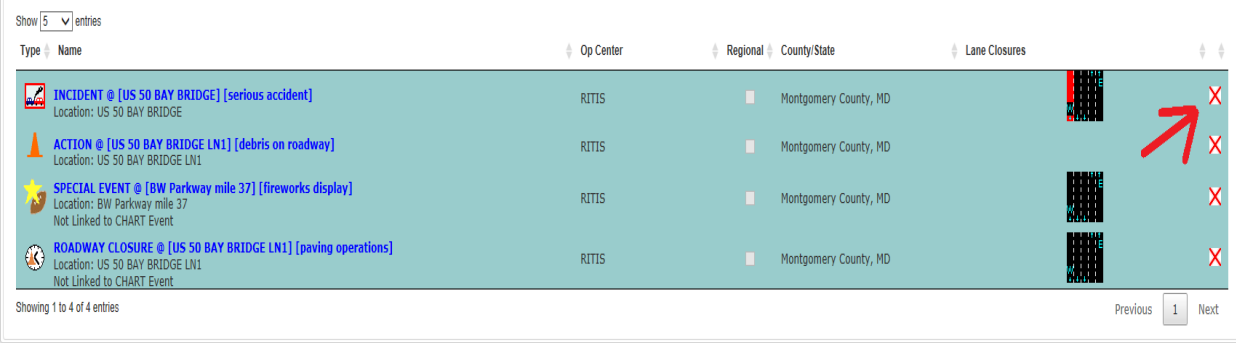


Figure 4-12 Removing Interesting Flag for the External Event.

4.1.3 Sort Events List.

This section describes the sorting of Events List on the Home Page in the CHART GUI and comprises work done in the following PR.

- ATMS-2379: Flash – Home Page – Event Lists – Sort List.

See the column sorting explanations below. In each case, the descending order case will reverse the ascending case.

4.1.3.1 Name Column.

Column sorting is common to all event sub-tabs under the Events tab. Clicking the Name column header sorts the events in ascending alphabetical order, with a secondary sort on the event opened time (descending) as shown in Figure 4-13.

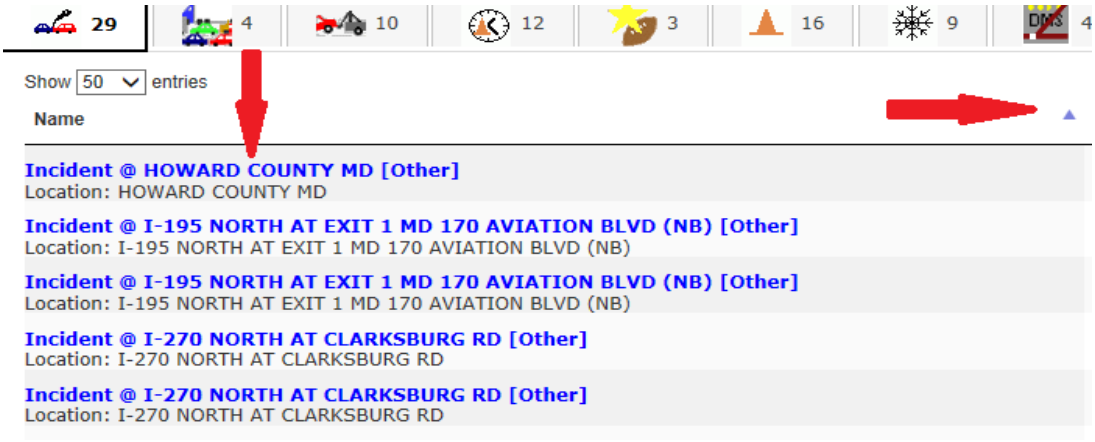


Figure 4-13 Events List Name Column Sorting.

4.1.3.2 Op-Center Column.

This column sorting is common to all the tabs in the Events List. When clicking on the OpCenter Column header events are sorted in alphabetical ascending order, and if op centers are matched in more than 1 row then they are sorted in descending order of time event is opened, as shown in the Figure 4-14.

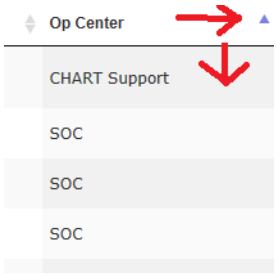


Figure 4-14 Events List Op-Center Column Sorting.

4.1.3.3 Regional Column.

This column sorting is common to all the tabs in the Events List. When clicking on the Regional Column header events that have regional indicator checked are sorted in ascending order, and if matches on the regional indicator occur in more than 1 row then they are sorted in descending order of time event is opened, as shown in the Figure 4-15.

Figure 4-15 Events List Regional Column Sorting.

4.1.3.4 County/State Column.

This column sorting is common to all the tabs in the Events List. When clicking on the County/State Column header events list is sorted in ascending alphabetical order of the County/State text. If the County and State are matched in more than 1 row then events are sorted in descending order of time event is opened, as shown in the Figure 4-16.

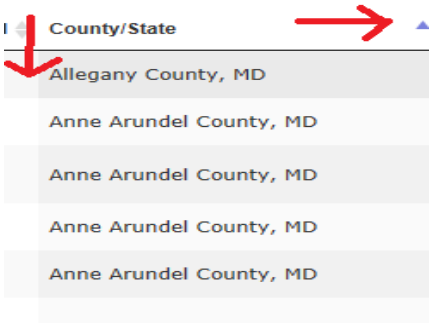


Figure 4-16 Events List County/State Column Sorting.

4.1.3.5 Lane Closure Column.

This is common to Planned Closure, Special Events, and External Events tabs only. When clicking on the Lane Closure column header the first time, the events are sorted in ascending order based on the number of lanes closed. If events have the same number of lanes closed then they are sorted in descending order based on the time the event is opened as shown in Figure 4-17.

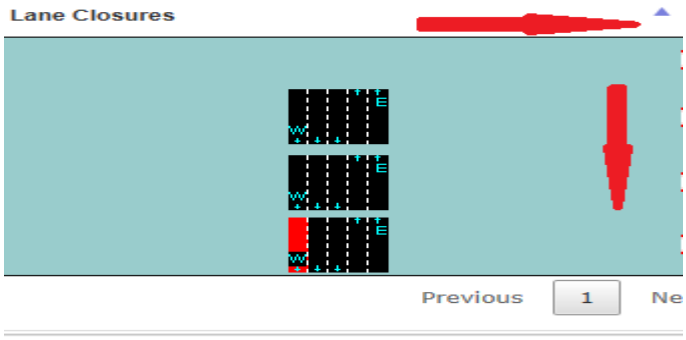


Figure 4-17 Events List Lane Closure Column Sorting.

A different case for the Incidents Lane Closures column as follows. When clicking on the Incidents Lane Closures column the first time, the events are sorted in descending order on the number of lanes closed. If events have the same number of lanes closed then they are sorted in ascending order at the time the event is opened, as shown in Figure 4-18.

Figure 4-18 Events List Lane Closure Column Sorting in Incident Tab.

4.1.3.6 Vehicles Involved Column.

This is particular to the Incidents tab only. When clicking on the Vehicles column, that the incidents table is sorted in descending order on the number of vehicles involved, and if the number of vehicles involved matches a similar row, then incidents are sorted in ascending order at the time the event is opened, as shown in Figure 4-19.

Figure 4-19 Events List Vehicles Column Sorting in Incident Tab.

4.1.3.7 Recurring Column.

This is particular to the Congestions tab only. When clicking on the Recurring column, events with recurring checked are displayed before those not set to recurring. A secondary sort is done in descending order of time the event opened, as shown in Figure 4-20.

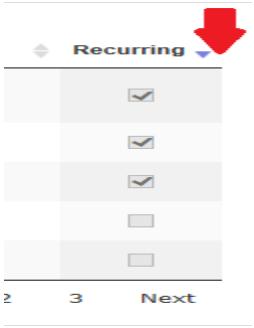


Figure 4-20 Events List Recurring Column Sorting in Congestion Tab.

4.1.3.8 Vehicle Info Column.

This is particular to the Disabled Vehicle Events tab only. When clicking on the Veh. Info column, events are sorted in ascending order of the Tag info. If events have the same tag info, then they are sorted in descending order of time event is opened, as shown in Figure 4-21.

Figure 4-21 Events List Veh. Info Column Sorting in Disabled Vehicle Events Tab.

4.1.3.9 Road Conditions Column.

This is particular to the Weather service Events tab only. When clicking on the Road Conditions column, events are sorted in alphabetical ascending order of the Road Conditions text. If events have similar road conditions text, then matches in these rows are sorted in descending order of time event is opened, as shown in the Figure 4-22.

Figure 4-22 Events List Road Conditions Column Sorting in Weather Service Tab.

4.1.3.10 Type Column.

This is particular to the external Events tab only. When clicking on the Event Type column, events are sorted n the following order: Incidents, Congestion Events, Disabled Vehicle Events, Planned Closure Events, Special Events, Action Events, and then Weather Events. For events of the same type, the rows, in this case, are sorted in descending order of time event is opened. Clicking on the column a second time will reverse the above ascending case, as shown in Figure 4-23.

Figure 4-23 Events List Type Column Sorting in External Events Tab.

4.2 Home Page Event Resources – Flash Replacement

This section describes the updates in R18 for the removal of Flash from the Event Resources List tabs of the Home Page in the CHART GUI.

4.2.1 ATMS-2380: Flash - Home Page - Event Resources – Display Event Resource Lists

The display of the Field Units tab and Facilities tab on the home page differs from the previous R17 Flash based portal with the addition of a Show Entries and Paging controls. The Show Entries control allows the user to select a specific number of field units or facilities to display within the current window before the remainder are displayed on subsequent pages. The increments provided are: 20, 40, 80, 100, or All with the All case displaying all field units on a single page. The default of 20 field units or facilities is displayed initially.

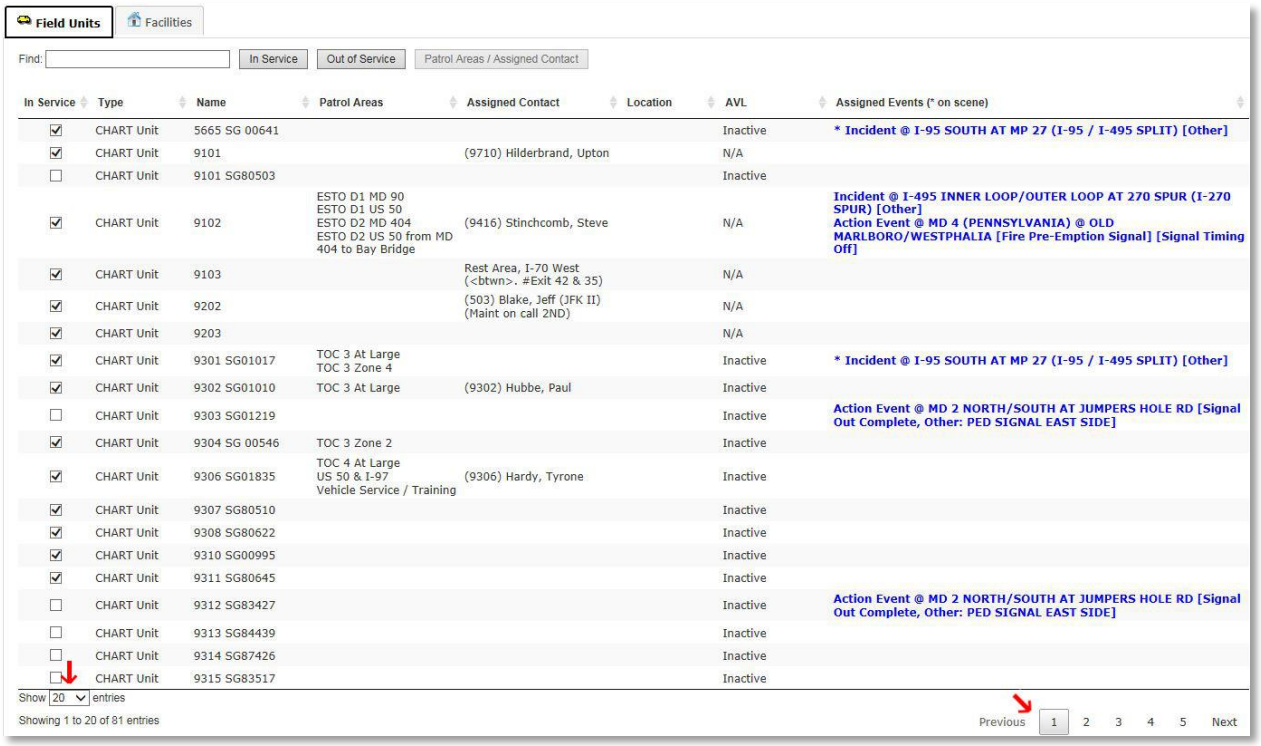


Figure 4-24 Resources Tab – Initial Field Units Tab

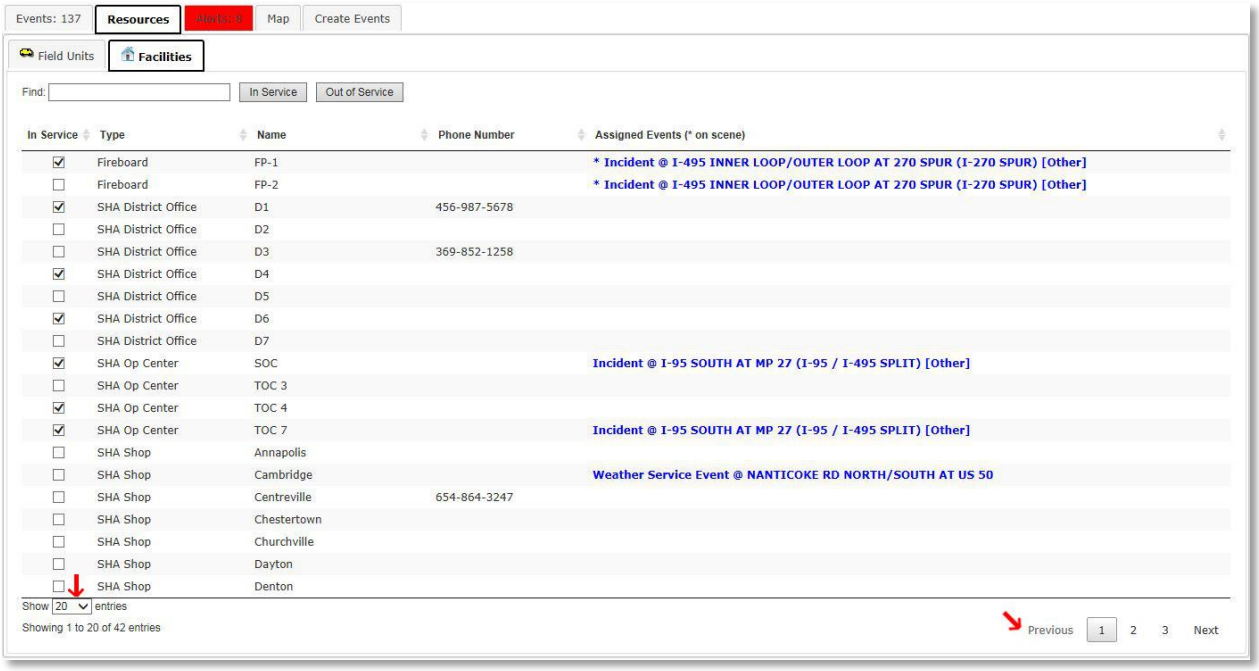


Figure 4-25 Resources Tab – Initial Facilities Tab

4.2.2 ATMS-2381: Flash – Home Page – Event Resources – Set In-Out Of Service

This section describes the updates in R18 for the Set In-Out Service options available on the Event Resources List tabs of the Home Page in the CHART GUI.

The Find search within the Field Units tab for selecting a field unit to place in or out of service has been updated with a similar type-ahead drop-down control. The control will list items in the following categories and with the following results upon selection. A maximum of 100 items will be displayed within the scrollable control when no text is entered.

1) Field Unit Names: The complete list of unique field unit names without the type will be displayed first within the control when the user initially activates the drop-down.

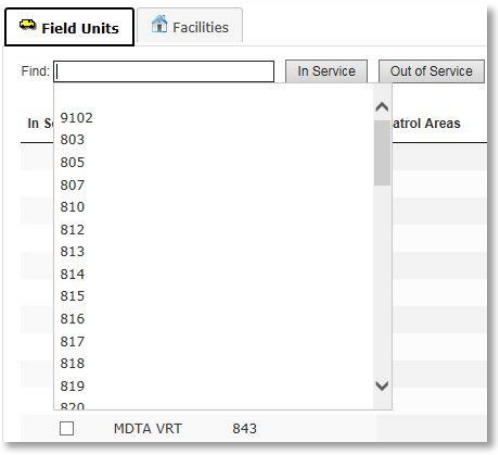


Figure 4-26 Search Field Units By Field Unit Name

When a field unit name is selected either by entering partial name text or clicking on the field unit name, the list of field units will be filtered to only the selected row. The row will also be highlighted allowing the user to activate either the **In Service** or **Out Of Service** buttons or **In/Out Service** checkbox for a user with the Basic Operations and operator rights. For a field unit which is currently in service and for the user with the Manage Traffic Event right, the **Patrol Areas / Assigned Contact** button will also be enabled.

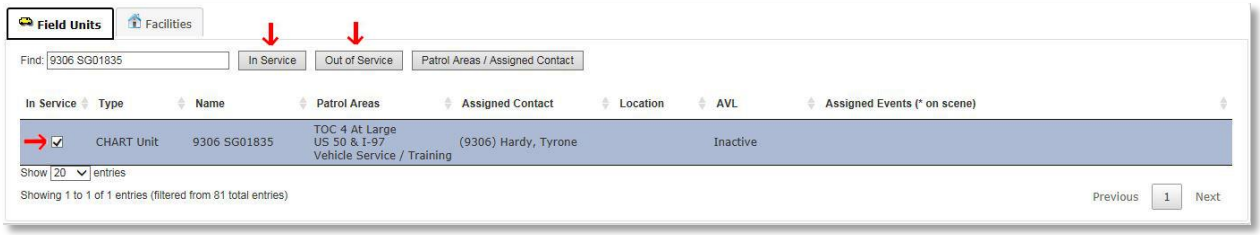


Figure 4-27 Search Field Units By Field Unit Name Results

2) Patrol Area Names: The list of any patrol area names currently assigned to any field units will follow the field unit names. This will differ from R17 in that entering partial text of a patrol area name will now return the patrol area name in the drop-down control.

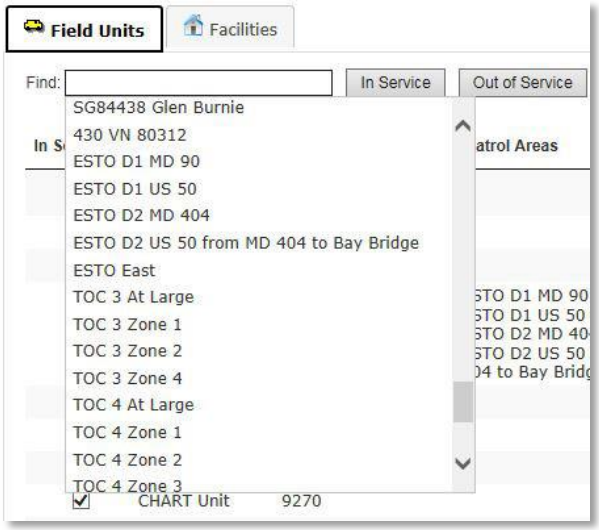


Figure 4-28 Search Field Units By Assigned Patrol Area Name

When a patrol area name is selected either by entering partial name text or clicking on the patrol area name, the list of field units will be filtered to the field unit(s) which currently include the selected name within their assigned patrol areas. This can be one or many rows, thus the user will be required to click anywhere within a row to select the row before using either the **In Service** or **Out Of Service** buttons, or applicable **Patrol Areas / Assigned Contact** button.

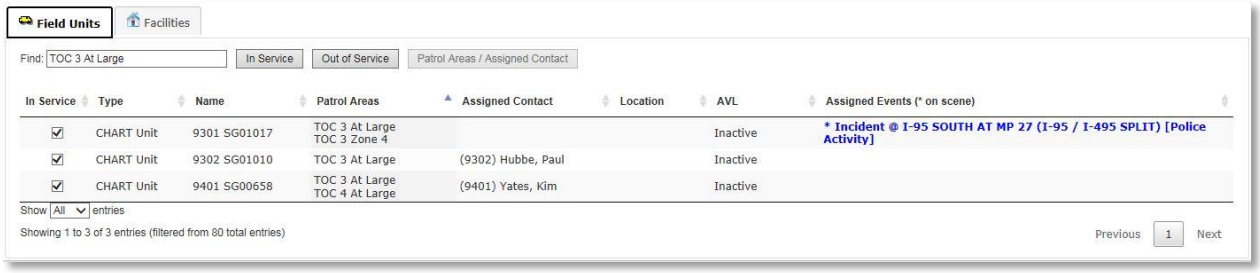


Figure 4-29 Search Field Units By Assigned Patrol Area Name Results

3) Assigned Contact Names: The list of any contacts currently assigned to any field units will follow the patrol area names. This will also differ from R17 in that entering partial text of a contact name (Call Sign, First Name, or Last Name) will now return the contact name with any applicable call sign in the drop-down control.

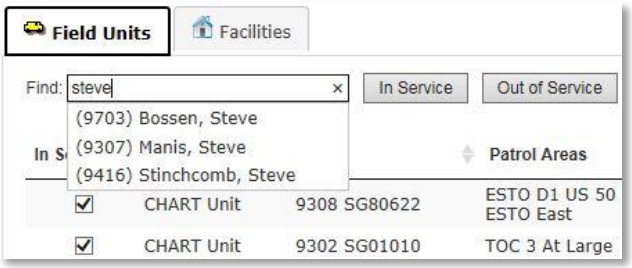


Figure 4-30 Search Field Units By Assigned Contact Name

When a contact name is selected either by entering partial name text or clicking on the contact name, the list of field units will be filtered to the field unit(s) which currently are assigned to the selected contact. This can be one or many rows, thus the user will be required to click anywhere within a row to select the row before using either the **In Service** or **Out Of Service** buttons, or applicable **Patrol Areas / Assigned Contact** button.

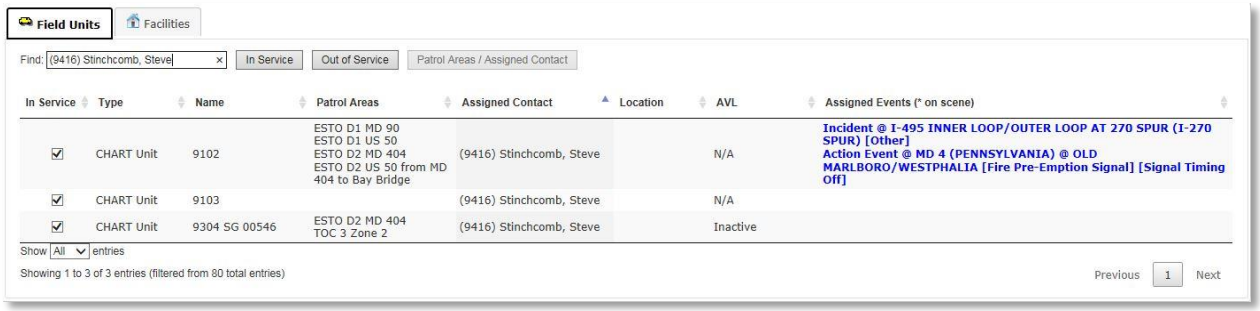


Figure 4-31 Search Field Units By Assigned Contact Name Results

The Find search within the Facilities tab for selecting a facility to place in or out of service has also been updated with a similar type-ahead drop-down control. The control will list only facility names when the user initially activates the drop-down. A maximum of 100 facilities will be displayed within the scrollable control when no text is entered.

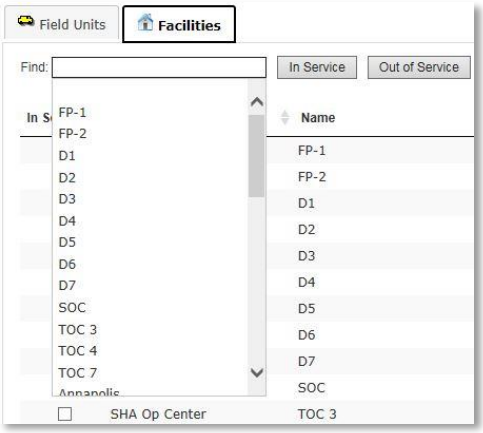


Figure 4-32 Search Facilities By Facility Name

When a facility name is selected either by entering partial name text or clicking on the facility name, the list of facilities will be filtered to only the selected row. The row will also be highlighted allowing the user to activate either the **In Service** or **Out Of Service** buttons or **In/Out Service** checkbox for a user with the Basic Operations and operator rights.

Figure 4-33 Search Facilities By Facility Name Results

4.2.3 ATMS-2382: Flash – Home Page – Event Resources – Select Contact, Patrol Areas Putting Field Unit In Service

This section describes the updates in R18 for the selection of Patrol Area(s) and Assigned Contact on the Event Resources Field Units tab of the Home Page in the CHART GUI.

For a user with the Basic Operations and Manage Traffic Event rights, patrol area(s) and/or a contact may be assigned to a field unit at the time the field unit is placed in service or anytime during when the field unit is currently in service. See **ATMS-2381** for details on selecting a field unit row to place in service, or selecting a specific field unit which is already in service.

When the Patrol Areas / Assigned Contact Dialog is open, clicking on the following buttons results in the associated action:

1) OK button: For an out of service field unit, the field unit will be placed in service with any optional user selections for a contact and/or patrol area(s). For an in service field unit, any modifications to the optional assigned contact and/or patrol area(s) will be performed with no update to the in service flag status.
2) Cancel button: For an out of service field unit, the cancel event will erase any user selections for the assigned contact and patrol areas, and leave the field unit out of service.

For an in service field unit, no modifications will be made to either the in service flag nor the current patrol areas / assigned contact.

3) X button: Clicking on the window close icon will follow the same rules applied to clicking on the Cancel button.

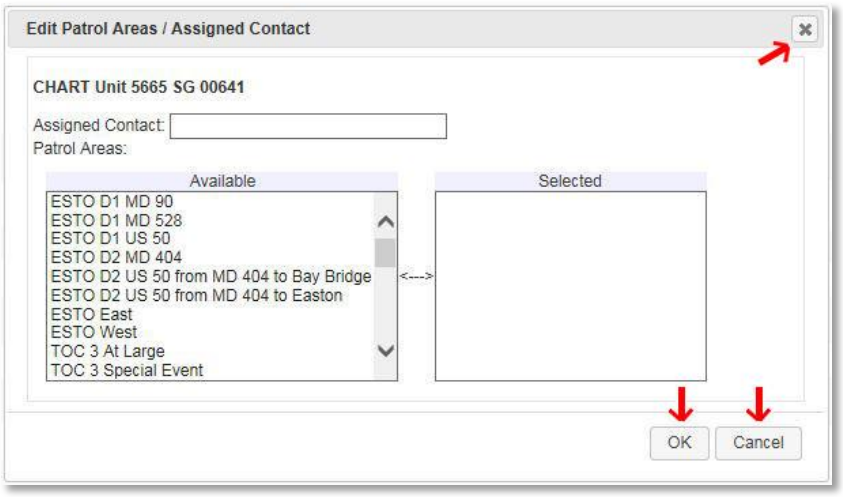


Figure 4-34 Initial Patrol Areas / Assigned Contact Dialog

When the Patrol Areas / Assigned Contact Dialog is open, the Assigned Contact field may be used to search for and select a contact to assign to the field unit. For the particular field unit, the list of selectable contacts will consist of call list contacts of the field unit and any contacts within the system which have the Allow Resource Assignment indicator activated. The input allows searching by any partial text of a contact name: Call Sign, First Name, or Last Name.

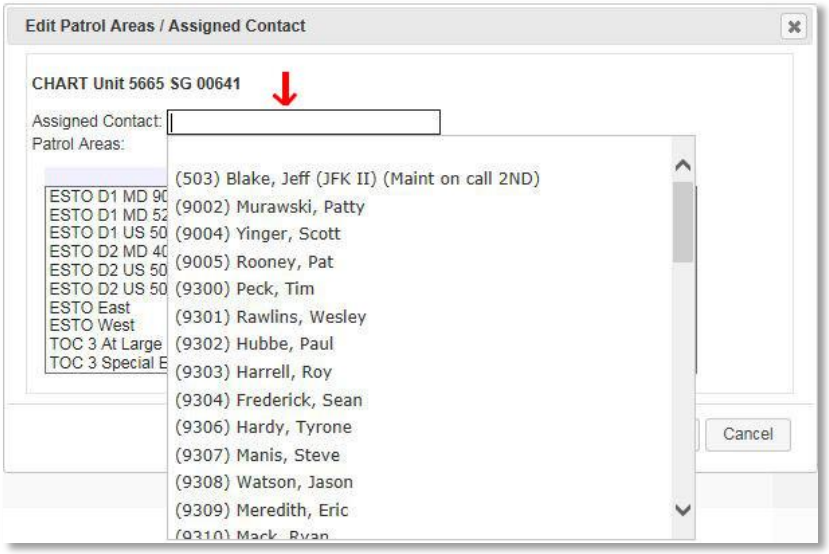


Figure 4-35 Resources Dialog Select Assigned Contact

When the Patrol Areas / Assigned Contact Dialog is open, the Patrol Areas Available and Selected option fields may be used to manage the patrol area(s) to assign to the field unit. Clicking on any patrol area name within the Available field will add the patrol area to the current selections, and move the selected patrol area to the Selected option field. Likewise, clicking on any patrol area name within the Selected field will mark the patrol area as de-selected and move the patrol area back to the Available option field. Zero or more patrol areas may be selected.

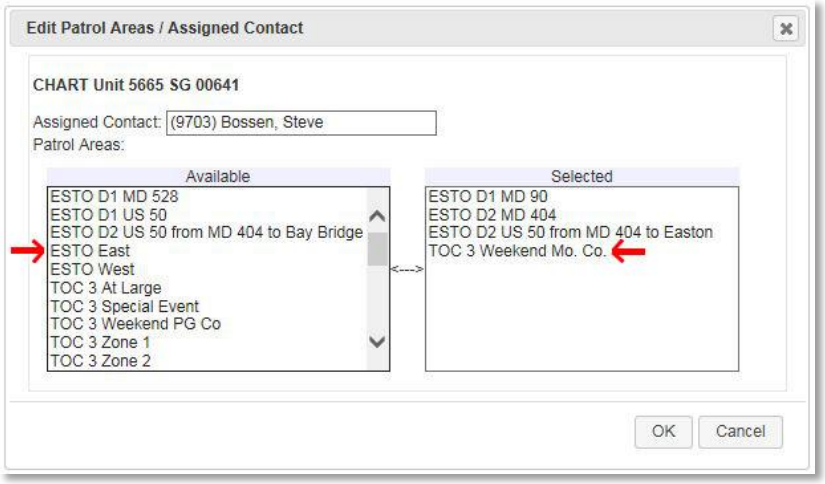


Figure 4-36 Resources Dialog Select Patrol Area(s)

Once the Patrol Areas / Assigned Contact Dialog is submitted with the OK button, the updated selections will be displayed for the specific field unit within the Resources Field Units tab.

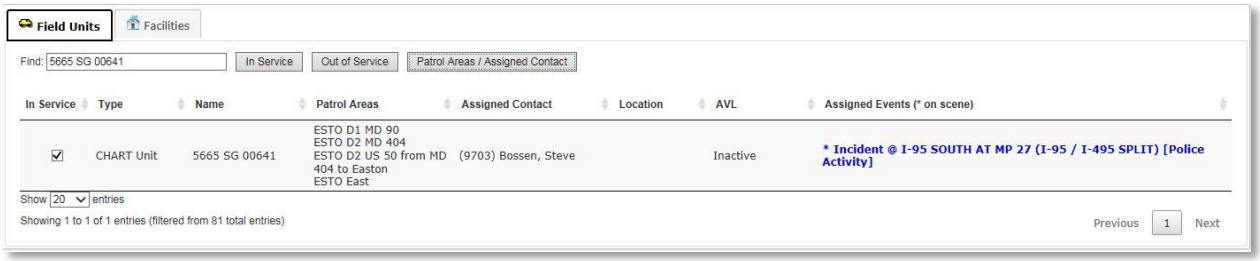


Figure 4-37 Resources Dialog Submit Results

4.2.4 ATMS-2383: Flash – Home Page – Event Resources – Sort Event Resource Lists

This section describes the updates in R18 for the sorting of the Event Resources Lists on the Home Page in the CHART GUI. The sorting mechanism for the Field Units and Facilities tables in R18 will differ slightly from the sort mechanism used in R17. See the column sorting explanations below. In each case, the descending order case will reverse the ascending case.

1. In-Service Column (Field Units / Facilities): The In Service column when selected in ascending order will sort the respective list by resources which are currently in service, followed by resources which are out of service. A secondary sort will be applied on the Type column of the respective resources list.

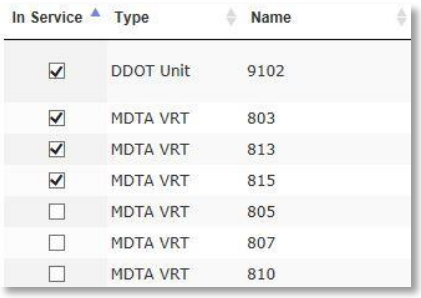


Figure 4-38 Resources List In Service Column Sorting

2. Type Column (Field Units / Facilities): The Type column when selected in ascending order will sort the respective list by alphabetical ordering of the type name. A secondary sort will be applied to the Name column of the respective resources list.

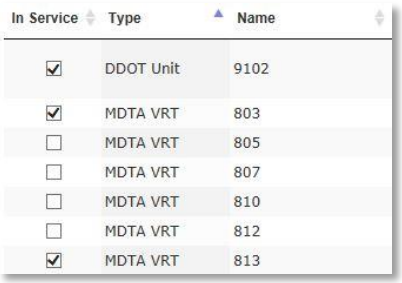


Figure 4-39 Resources List Type Column Sorting

3. Name Column (Field Units / Facilities): The Name column when selected in ascending order will sort the respective list by alphabetical ordering of the resource name. A secondary sort will be applied to the Type column of the respective resources list.

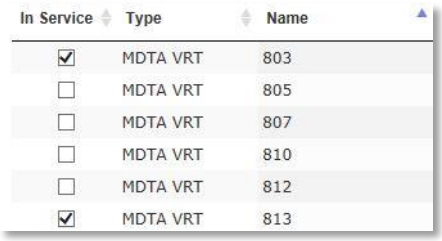


Figure 4-40 Resources List Name Column Sorting

4. Assigned Events Column (Field Units / Facilities): The Assigned Events column when selected in ascending order will sort the respective list first by ordering those resources which are participating in at least a single event before any resources which are not currently participating in any events. Within the group of resources participating in at least one event, the first Event Name in the list of events for any resource will be used in the comparison of the group. A secondary sort will be applied to any duplicated values on the Type column of the respective resources list.

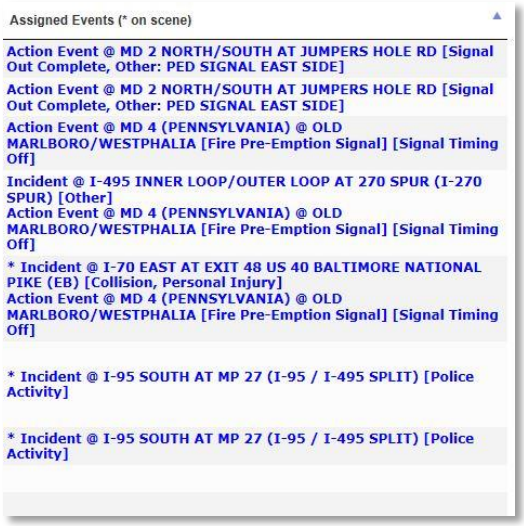
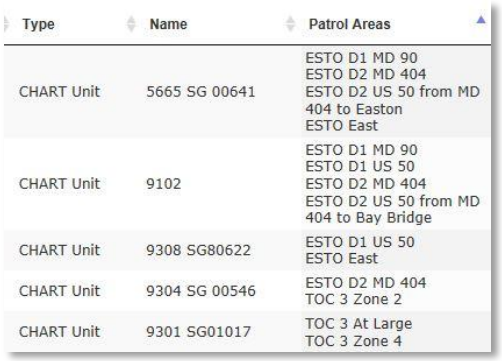


Figure 4-41 Resources List Assigned Events Column Sorting

5. Patrol Areas Column (Field Units): The Patrol Areas column when selected in ascending order will sort the Field Units list first by ordering those field units which have at least a single patrol area assigned before any field units which currently have no patrol areas assigned. Within the group of field units with at least one patrol area assigned, the first Patrol Area name in the list of patrol areas for any field unit will be used in the comparison of the group. A secondary sort will be applied to any duplicated values on the Field Unit Name column.



Type	Name	Patrol Areas
CHART Unit	5665 SG 00641	ESTO D1 MD 90 ESTO D2 MD 404 ESTO D2 US 50 from MD 404 to Easton ESTO East
CHART Unit	9102	ESTO D1 MD 90 ESTO D1 US 50 ESTO D2 MD 404 ESTO D2 US 50 from MD 404 to Bay Bridge
CHART Unit	9308 SG80622	ESTO D1 US 50 ESTO East
CHART Unit	9304 SG 00546	ESTO D2 MD 404 TOC 3 Zone 2
CHART Unit	9301 SG01017	TOC 3 At Large TOC 3 Zone 4

Figure 4-42 Field Unit List Patrol Areas Column Sorting

6. Assigned Contact Column (Field Units): The Assigned Contact column when selected in ascending order will sort the Field Units list first by ordering those field units which have a contact currently assigned before any field units which have no contact assigned. Within the group of field units with an assigned contact, the complete contact text starting with the contact call sign followed by the last name, first name will be used in the comparison of the group. A secondary sort will be applied to any duplicated values on the Field Unit Name column.

Name	Patrol Areas	Assigned Contact
9308 SG80622	ESTO D1 US 50 ESTO East	(9004) Yinger, Scott
SG30021	TOC 3 Zone 1	(9004) Yinger, Scott
9302 SG01010	TOC 3 At Large	(9302) Hubbe, Paul
SG83519		(9306) Hardy, Tyrone
9401 SG00658	TOC 3 At Large TOC 4 At Large	(9401) Yates, Kim
9405 SG00611	TOC 4 Zone 1	(9405) Iman, Joe

Figure 4-43 Field Unit List Assigned Contact Column Sorting

7. Location / AVL Column (Field Units): The Location column when selected in ascending order will sort the Field Units list first by ordering those field units which have a valid location and AVL vehicle id viewable on the ATMS map. Field units which do not have a valid location and/or an Inactive AVL vehicle id will follow the above field units. Within the group of field units with a valid location and AVL vehicle id, the alphabetical ordering of the location text will be used in the Location column. Within the AVL ascending order case, a secondary sort on the Field Unit Type column will be applied instead of the Location column.

Location	AVL
City, US 50	Active (view map)
City, US 50	Active (view map)
City, US 50	Active (view map)
City, US 50	Active (view map)
	Inactive
	Inactive
	Inactive
	Inactive

Figure 4-44 Field Unit List Location / AVL Column Sorting

8. Phone Number Column (Facilities): The Phone Number column when selected in ascending order will sort the Facilities list by alphabetical ordering of the phone number. A secondary sort will be applied on the Facilities Type column.

Phone Number
258-789-3215
369-852-1258
456-987-5678
654-864-3247
896-789-7417

Figure 4-45 Facilities Phone Number Column Sorting

4.3 Home Page Alerts – Flash Replacement

This section describes the updates in R18 to the display of the Home Page Alerts List in the CHART GUI. These changes are related to the removal of Flash Application Replacement.

4.3.1 Alerts List Display

This section describes general alerts list display and comprises work done in the following PRs:

- ATMS-2384: Flash - Home Page - Alerts - Display Alert Lists
- ATMS-2388: Flash - Home Page - Alerts - Sort Alert Lists

The display of the Home Page Alerts List differs from the previous R17 Flash based version with the addition of a Show Entries and Paging controls. The Show Entries control allows the user to select a specific number of Alerts to display within the current window before the remainder are displayed on subsequent pages. The increments provided are: 15, 25, 50, 100, or All with the All case displaying all Alerts (in a given state) on a single page. The default of 15 Alerts is displayed initially. See below.

Figure 4-46 Home Page Alerts List

Summary of existing functionality:

- Individual tabs for each Alert State (New, Accepted, Delayed, Closed).
- Each tab heading includes the current number of alerts displayed on that tab.
- Last tab is the Create Generic Alert dialog.
- Alerts list can be filtered based on User, Current Operations Center, or All.

- The Types, Description and Times columns are sortable.
- Alerts List will be outlined in red if any Alerts are displayed on the “New” tab.
- Main Alerts tab on Home Page will display in red if any Alerts are displayed on the “New” tab. The tab will also include the number of new alerts displayed.
- If alerts exist on the “New” alerts tab an alert summary section will be displayed directly below the main Home Page tabs when hovering over the tab. This summary section will have a yellow background and will displayed the most recent alerts in the new state based on the current alert filter. The number of alerts displayed in the summary continues to be configurable in the System Profile Properties. Below the most recent alerts the number of remaining alerts is displayed (See below).

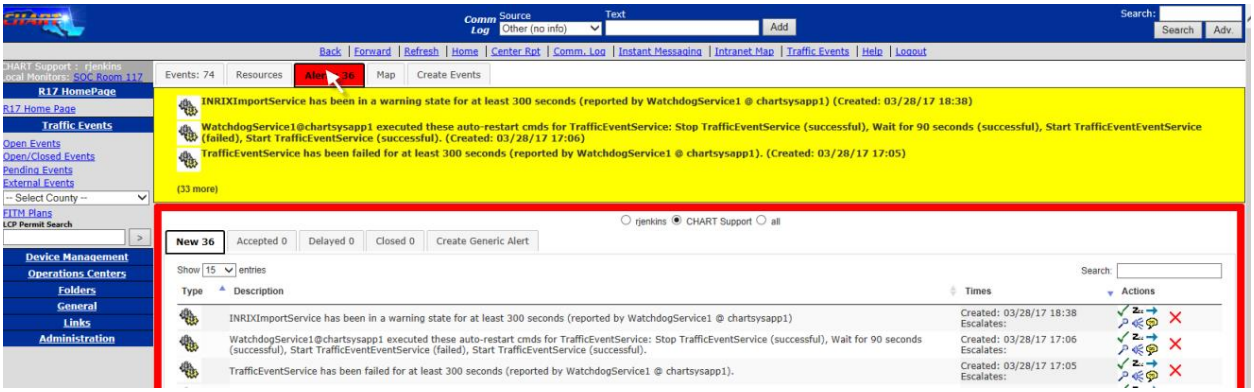


Figure 4-47 New Alert Summary Display

4.3.2 Perform Alert Actions

This section describes performing alert actions and comprises work done in ATMS-2386: Flash - Home Page - Alerts - Perform all alert actions.

Performing actions on Alerts works exactly the same way in R18. A grid of actions buttons is displayed in the Actions column on each of the 4 alerts tabs. The buttons available are specific to the current state of the alert. A red X is used as the close button for any open alert.

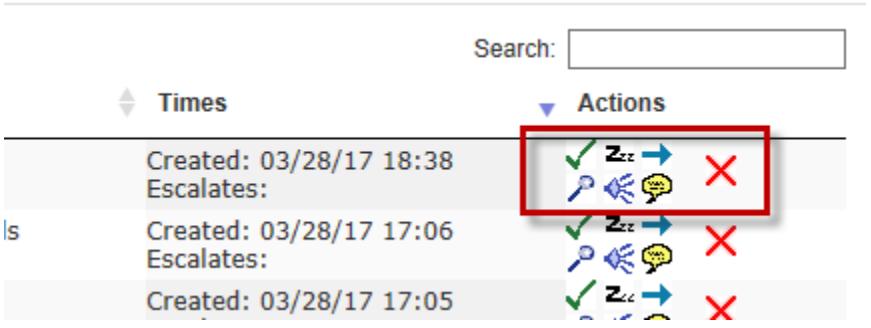


Figure 4-48 Alert Action Buttons

Summary of existing functionality:

- Accept action: Available on New or Delayed tabs. Moves alert to the Accepted tab.
- Un-accept action: Available on the Accepted tab only. Moves alert to the New tab.
- Delay action: Available on the New or Accepted tabs. Moves alert to the New tab.
- Un-delay action: Available on the Delayed tab only.
- Resolve action: Available on all tabs except Closed. Resolves alert based on alert type. Ex. Displays alert details for Generic Alert, Displays CHART Service details page for a service alert.
- Details action: Available on all tabs. Displays alert details page.
- Escalate action: Available on all tabs except Closed. Escalates alert if applicable.
- Add Comment action: Available on all tabs. Displays pop up allowing used to add a comment to the alert (See below).
- Close action: Permanently closed the alert. Available on all tabs except Closed.

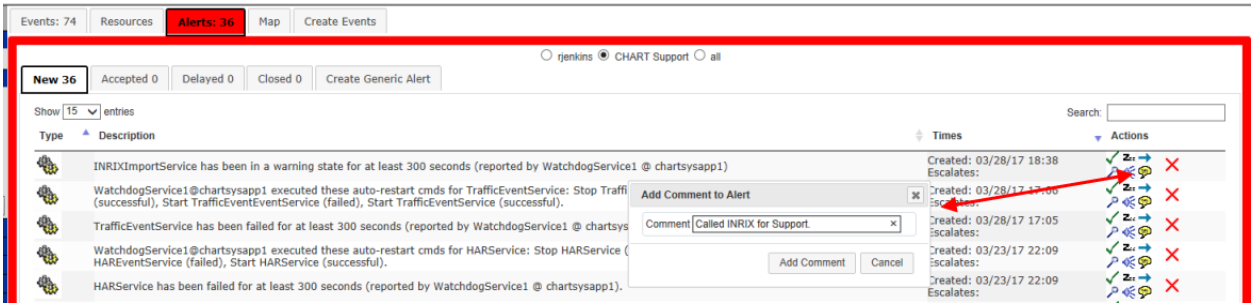


Figure 4-49 Add Comment to Alert Dialog.

4.3.3 Create Generic Alert

This section describes the creation of Generic Alerts and comprises work done in ATMS-2387: Flash - Home Page - Alerts - Create Generic Alert.

The last tab on the Home Page Alerts list contains the Create Generic Alert dialog exactly the same way in R18.

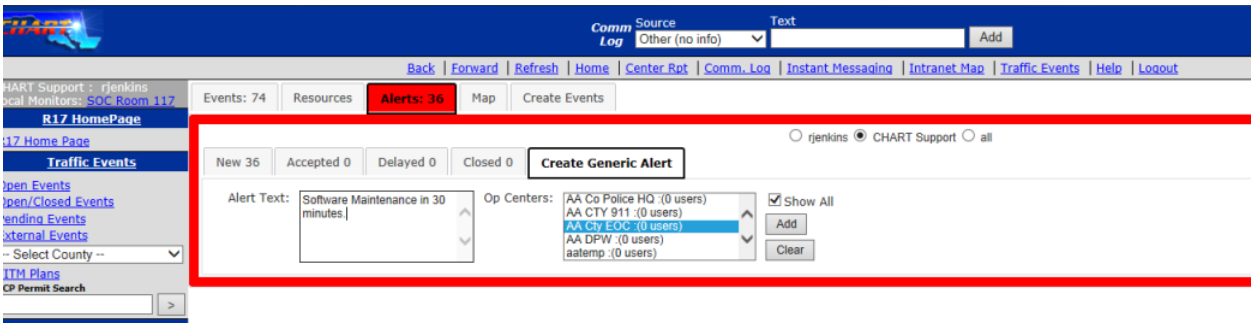


Figure 4-50 Create Generic Alert Dialog

4.3.4 Alert Audio Cues

This section describes Alert audio cue functions and comprises work done in ATMS-2385: Flash - Home Page - Alerts - Play audio cue.

Alert audio cues will work the same way in R18 as in previous versions.

Summary of existing functionality:

- Alert audio cue configuration in the System Profile Properties was unchanged and works exactly the same way.
- Periodically a New Alert reminder audio cue will play if any alerts exist in the New Alerts tab. Interval is configurable in System Profile Properties.
- When a New alert(s) is added the New Alerts (newly created alert, alert state change, filter change, etc…) an audio cue for that specific alert type will play. If multiple alerts are new to the New Alerts tab, multiple alter type audio cues will play consecutively.
- Alert type audio cues may preempt the New Alert Reminder audio cue.

4.4 Home Page Edit Location – Flash Replacement

This section describes the Edit Location application which creates/edits the location of Traffic Events, DMSs, HARs, SHAZAMs, Detectors, Cameras and On/Off Devices. This section comprises work done in the following PRs:

- ATMS-2391: Flash - Edit Location - ObjectLocation and form JavaScript data models
- ATMS-2392: Flash – Edit Location – Initialize Edit Location Form
- ATMS-2393: Flash – Edit Location – Select Alias / Show All Aliases Checkbox
- ATMS-2394: Flash – Edit Location – Select State
- ATMS-2395: Flash – Edit Location – Select County / Region
- ATMS-2396: Flash – Edit Location – Select Main Route Type
- ATMS-2397: Flash – Edit Location – Specify Main Route
- ATMS-2398: Flash – Edit Location – Set Show Name checkbox for Main Route

- ATMS-2399: Flash – Edit Location – Select Direction / Proximity
- ATMS-2400: Flash – Edit Location – Select Intersecting Feature Type
- ATMS-2401: Flash – Edit Location – Specify Intersecting Route
- ATMS-2402: Flash – Edit Location – Set Show Name checkbox for Intersecting Route
- ATMS-2403: Flash – Edit Location – Specify Intersecting Exit
- ATMS-2404: Flash – Edit Location – Specify Intersecting Milepost
- ATMS-2405: Flash – Edit Location – Location Description
- ATMS-2406: Flash – Edit Location – Interaction with Map

The new Edit Location form (left) features a more uniform and compact look than the original implementation (right). Field dependencies and defaults are retained from the original. A user's ability to override the form location using latitude and longitude coordinates from the map is also retained. For devices, latitude and longitude values can still be entered directly as before.

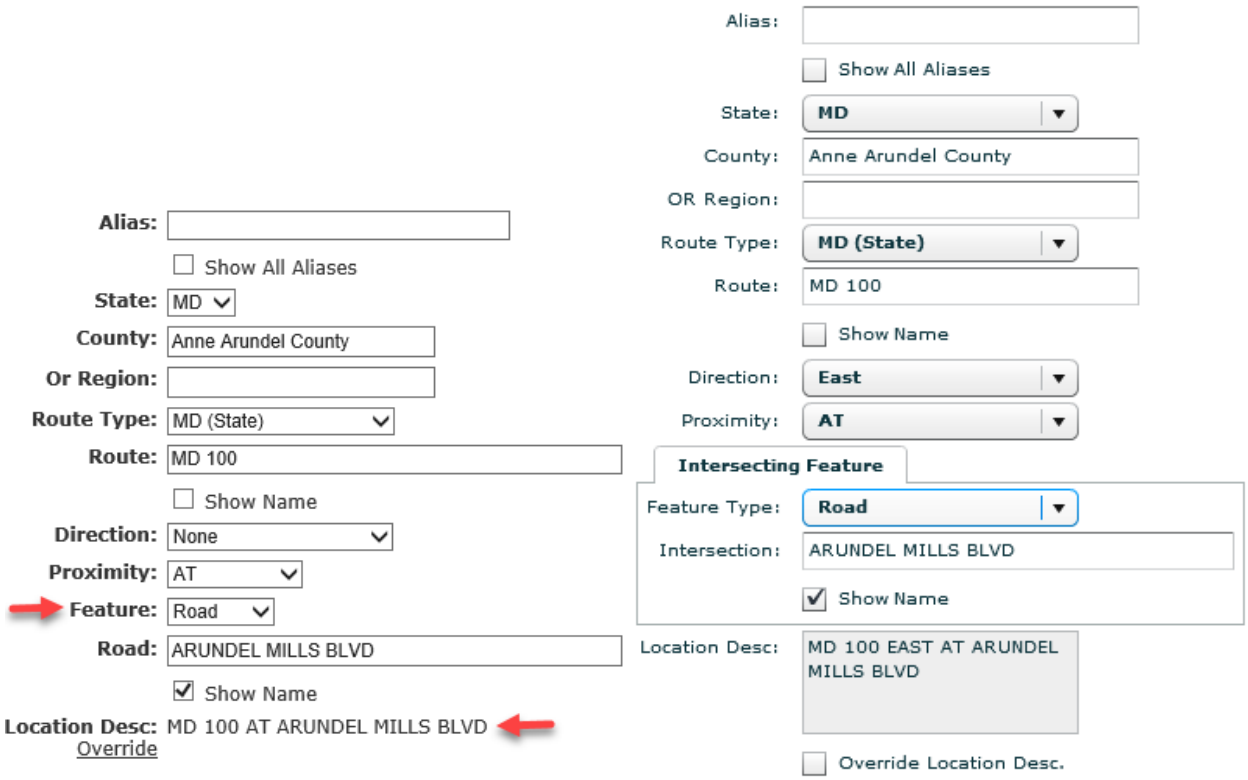


Figure 4-51 Edit Location Dialog New/Old

Although there are small differences in the behavior of the Edit Location application depending on the type of object being described (e.g. DMSs can only have a simple direction – not complex directions such as North/South), most behaviors are consistent across all devices and Traffic Events.

For Traffic Event locations where two intersection features are specified, the new form (left) allows users to view both features simultaneously and no longer requires the selection of a tab (right).

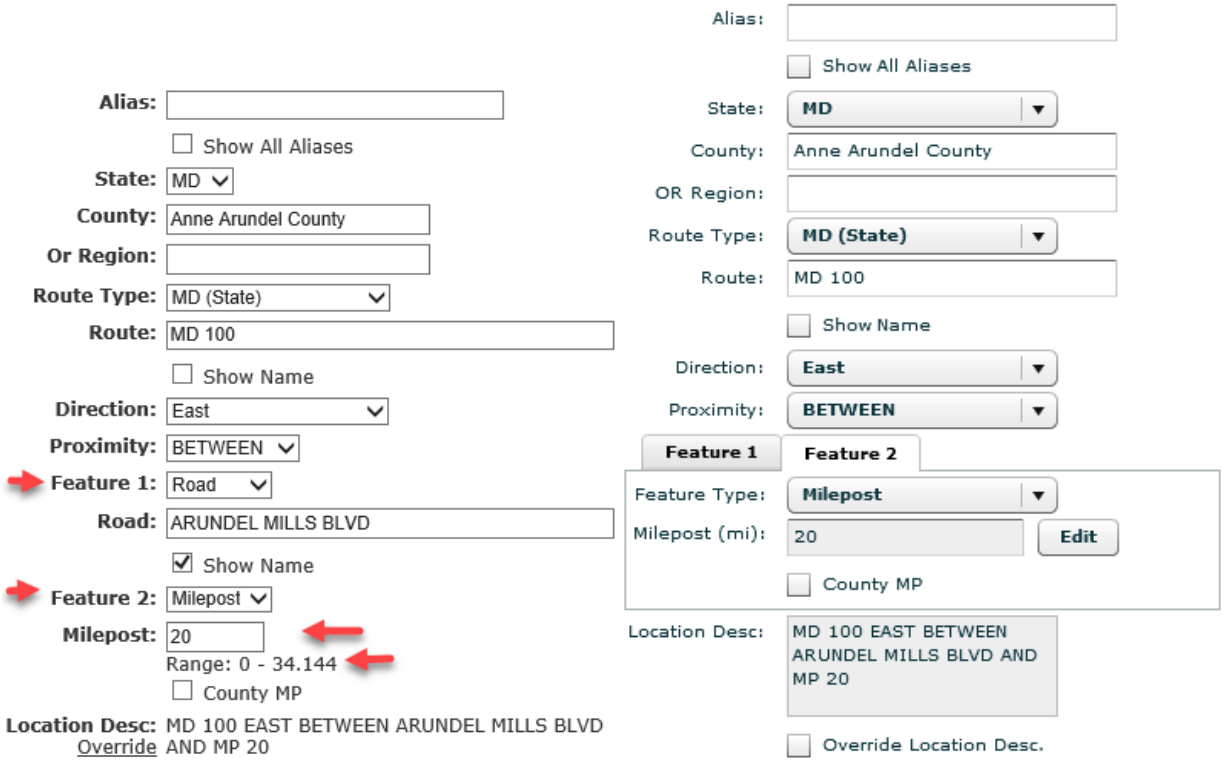


Figure 4-52 Edit Location Dialog Two Features New/Old

Many of the Edit Location fields are wider and can now overlap the map and the lower part of the form, if necessary.

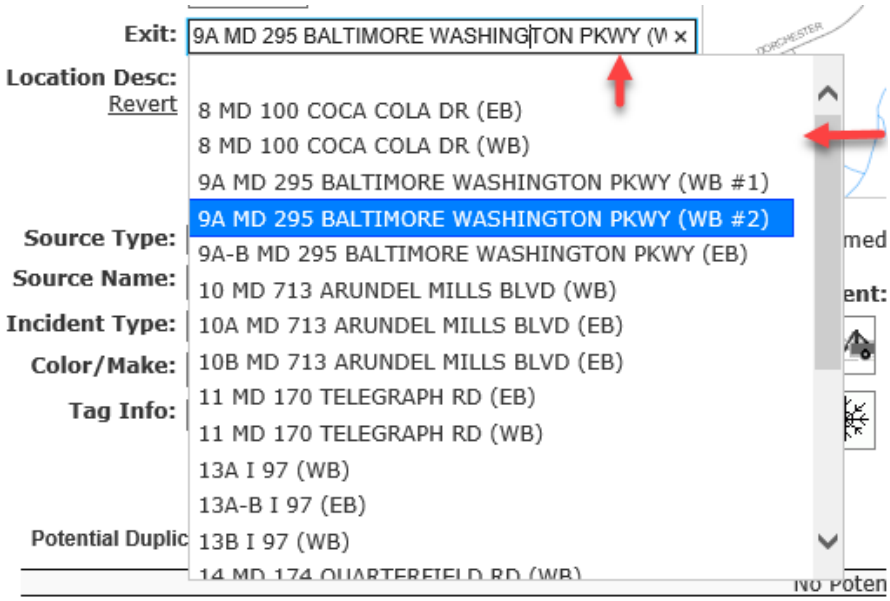


Figure 4-53 Edit Location Wider Fields

Due to performance concerns, visible lists are limited to 100 rows however users can type the first 1-3 letters to filter the list.

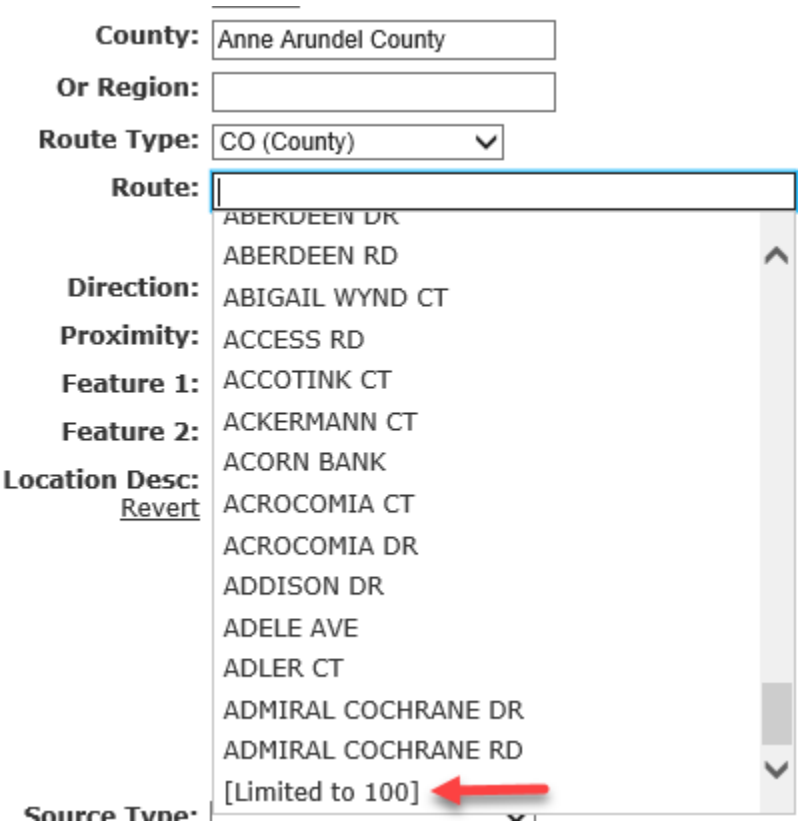


Figure 4-54 Edit Location Dialog – Long Drop Downs

4.5 Home Page Create Events – Flash Replacement

This section describes the creation of Events and comprises work done in the following PRs:

- ATMS-2390: Flash – Event Launcher Flex App - Create Event.
- ATMS-2412: Flash – Event Launcher Flex App – display – Update Event Launcher Form.
- ATMS-2389: Flash – Event Launcher Flex App – Potential Duplicate Events List.

The Create Events form is used in the following contexts and works in R18 the same way it did in previous releases:

- The Create Events tab on the Home Page
- The New Pending Traffic Event Form from the Pending Events List
- The New Traffic Event Form from the Comm. Log Page

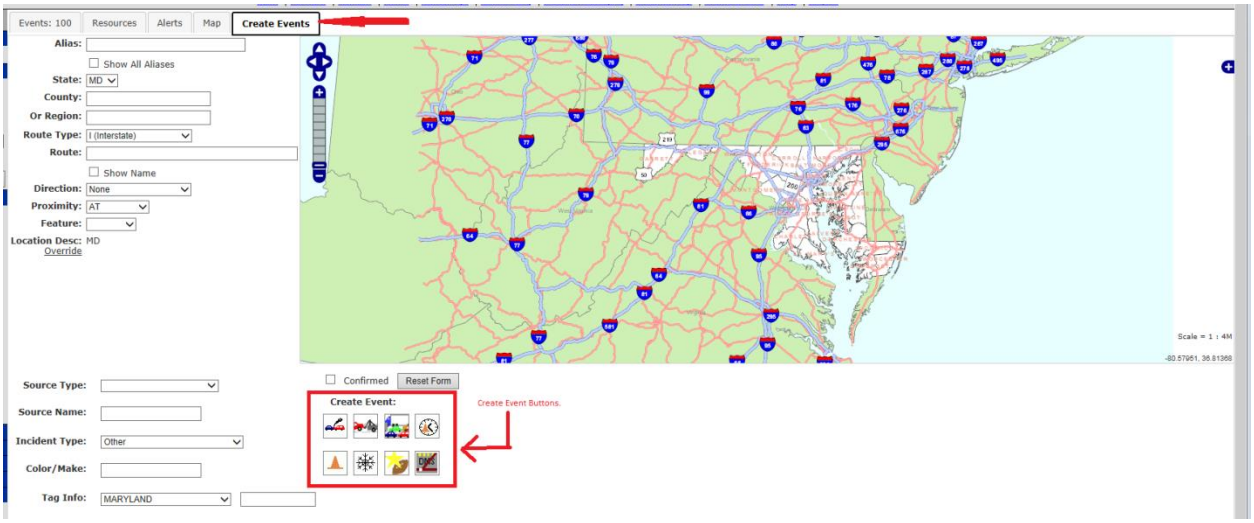


Figure 4-55 Create Event Form.

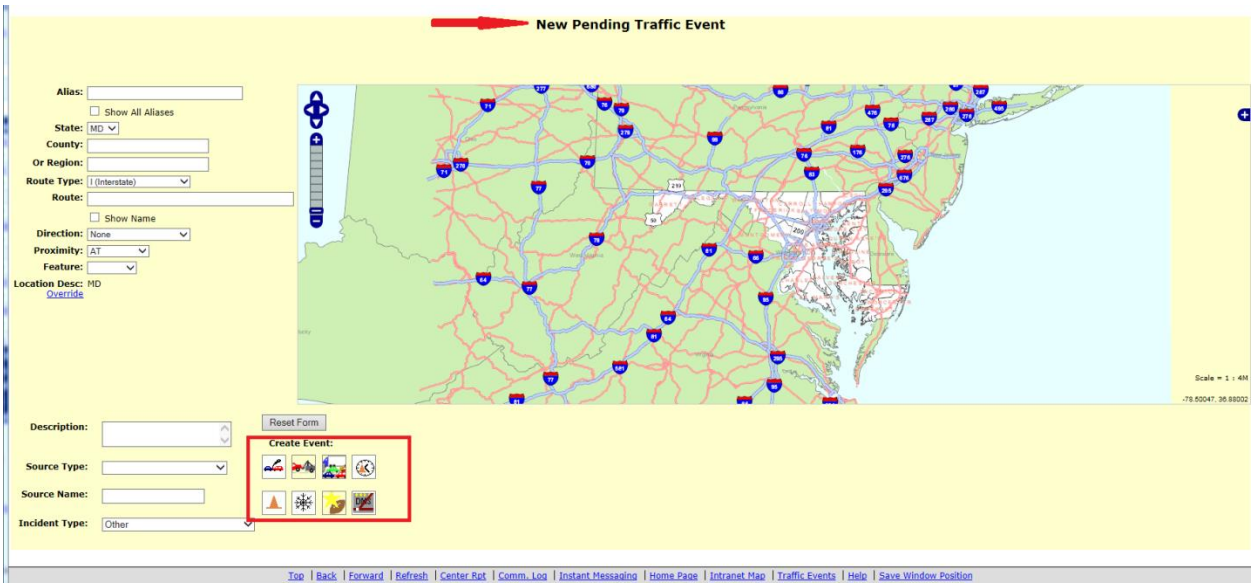


Figure 4-56 New Pending Traffic Event Form.

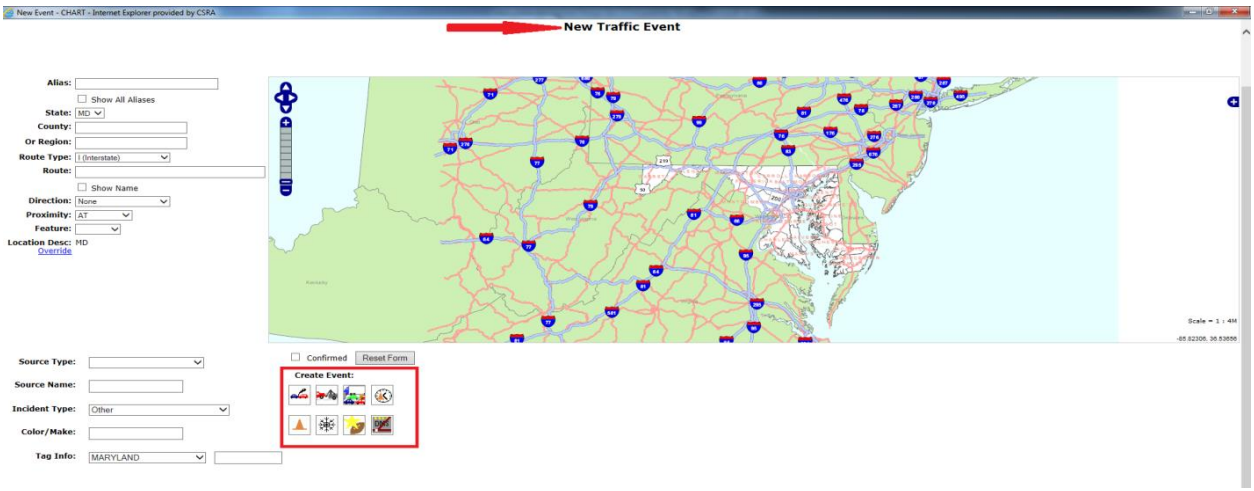
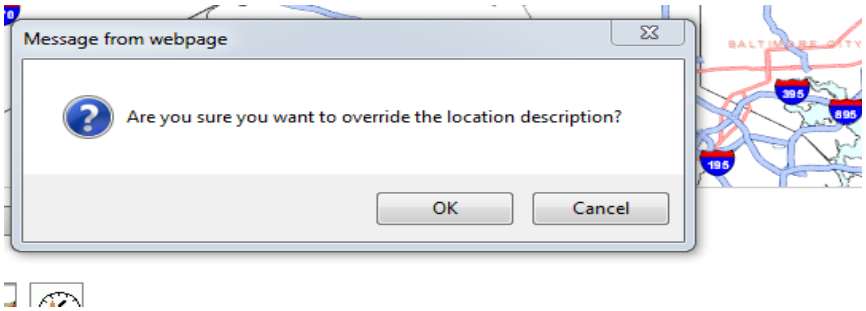


Figure 4-57 New Traffic Event Form.

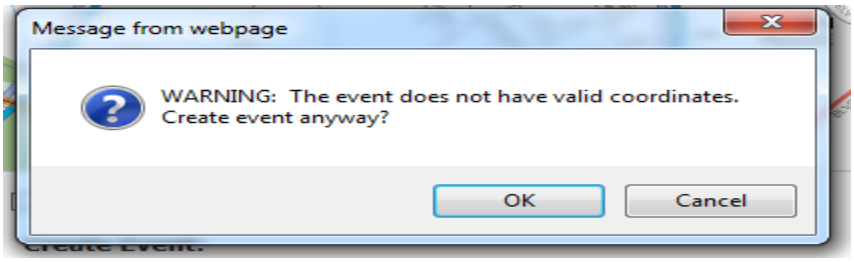
Summary of Existing Functionality:

- To create a new traffic event involves specifying the location (Location details are specified in the Section 4.4 Home Page Edit Location – Flash Replacement), optionally choosing a source type and name, optionally selecting an incident type (if the event is an incident), optionally entering vehicle Color/Make and Tag info (if the event is a Disabled Vehicle), and then clicking on one of the buttons specific to the type of the event.
- If the chosen source type is "Field Unit", the field below it will be renamed to "Field Unit" and will allow the user to select a field unit associated with user op-center from a list. The chosen field unit will be automatically added as a participant in the event and will be marked as notified.
- The Incident Type field allows the type of incident to be specified and is only used if an incident is created.

- The Color/Make and Tag info fields allow the information about a disabled vehicle to be entered, and are only used if a disabled vehicle event is created. For tag info, select a state then enter the tag number.
- The Confirmed checkbox can be used to initially mark the traffic event as confirmed, if the event is not yet confirmed, you can set the confirmed flag after the event has been created.
- Reset Button will reset the location fields and other event fields, then display default values.
- The buttons contain a graphic to indicate the type of the event that will be created, and hovering the mouse over a button shows a text description of the type of event that will be created.
- The system will prompt the user, to confirm the location description, if location description is overridden.



- Choose OK to confirm overriding the location description, Cancel, to use System provided Location Description for the event.
- The system will prompt the user, to overwrite the coordinates the system found for the intersecting feature.



- Choose OK to accept the Coordinates the system found for the intersecting feature, or choose to Cancel to keep the user-specified coordinates.
-  Incident Event – Creates the Incident event type.
-  Disabled Vehicle Event – Creates the Disabled Vehicle Event type.
-  Congestion Event – Creates the Congestion Event type.
-  Planned Closure Event – Creates the Planned Roadway Closure Event type.
-  Action Event – Creates the Action Event type.
-  Weather Service Event – Creates the Weather Service Event type.
-  Special Event – Creates the Special Event type.

-  Safety Message Event – Creates the Safety Message Event type.
- After creating the event, the event details are displayed in the Working window, a window separate from the Home Page.
- If New Traffic Event form is launched from the Communications Log Screen with selected log entries, then the Traffic Event form displays the Source and Source Description pre-populated with information from the selected communication log entry. The selected log entries that will be included in the event history are shown in the below figure.

Selected Log Entry	Author	Op Center	Time
Traffic Event "Incident @ MD [Collision, Fatality]" opened.	cnalla	SOC	15:24
Traffic Event "Incident @ MD [Collision, Personal Injury]" opened.	cnalla	SOC	15:23
Traffic Event "Incident @ 695 AT CALVERT STREET [Collision, Personal Injury]" opened.	cnalla	SOC	15:22
Traffic Event "Congestion Event @ MD" opened.	cnalla	SOC	13:48

- Creating a New Pending Traffic Event is similar to creating an open event.
- To differentiate between the Open event and Pending event, Pending event form has a light yellow background color.
- The difference between creating a New Pending event and an Open event are as follows,
    - User can't specify that the event is confirmed.
    - User can't specify a vehicle Make/Color or Tag number (Used for Disabled Vehicle Events).
    - List of Possible Duplicate events not shown.

4.5.1 Potential Duplicate Events List

The Potential Duplicate Events List is a list of events representing possible duplicates to the Event that is in the process of being created. It is displayed at the bottom of the Home Page Create Events form and the Comm Log / Create Event with Entries form.

Summary of Existing Functionality:

- List of recent events displayed at the bottom of the Home Page Create Event Form and also on the Comm Log / Create Event with Entries form. Display is similar in both cases.
- Configurable System Profile Property defines what to consider "Recent Events". System Profile / Traffic Event Settings / Duplicate Event Comparison Rules / Duplicate Events Max Comparison Age (minutes). Traffic events created within the look back period are considered "Recent".
- Recent Traffic Events List will be filtered on the following criteria selected on the Edit Location Form controls:
    - State.
    - County.
    - Region.
    - Route Type.
    - Route Desc / Road Name.

- Note: Regional Traffic Events do not filter on Route Type or Route Desc / Road Name.
- List contains 3 columns: (Event name, Create date / time and Operation Center). Both the Event name and Operation Center are links to the event details and op center details page respectively.
- List is sortable on all 3 columns.

Figure 4-58 Potential Duplicate Event List

Figure 4-59 Potential Duplicate Events List (None Found)

4.6 ATMS-2419: Remove Audio Recorder

This section describes the updates in R18 for the removal of the Audio Recorder Flash option on the HAR Editor and instances of HAR Editor in the CHART GUI. The Audio Recorder option in R17 existed as an optional link on the Audio Upload form when the Audio option was selected by the user. This option is removed in R18 while allowing the user to continue to upload previously recorded audio files in acceptable CHART formats (see Use Case 41.0). The following pages will be updated in R18.

1. HAR Details Set Message (Custom) Editor: The Set Custom Message Editor can be accessed from the HAR Details page for a HAR in Maintenance Mode, and for a user with the Configure HAR, Maintain HAR, and View HAR Configuration rights. The editor can be placed in Standard or Advanced mode for audio upload of a single or multiple HAR audio sections.

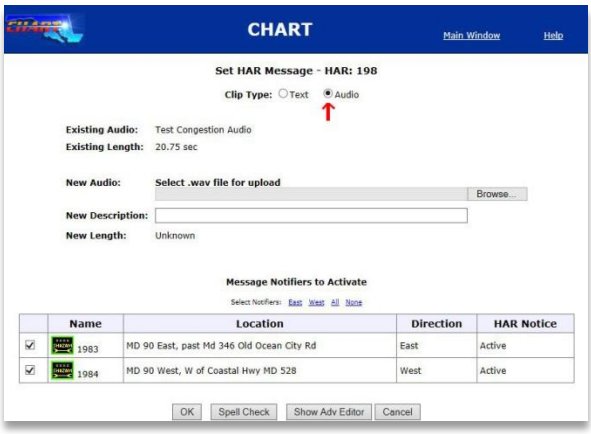


Figure 4-60 HAR Custom Message Standard Editor Audio Upload

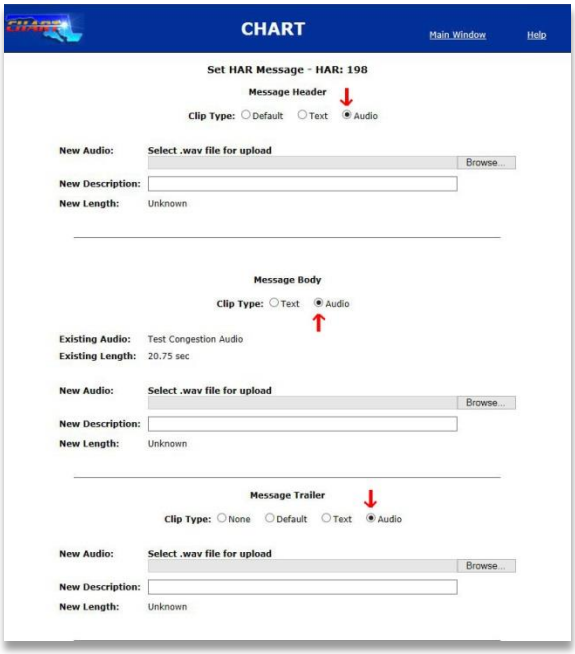


Figure 4-61 HAR Custom Message Advanced Editor Audio Upload

2. HAR Triggered Message Editor: The Add or Edit Triggered Message Editor can also be accessed from the HAR Details page for a user with the Configure HAR Triggered Messages and Enable/Disable HAR Triggered Messages rights.

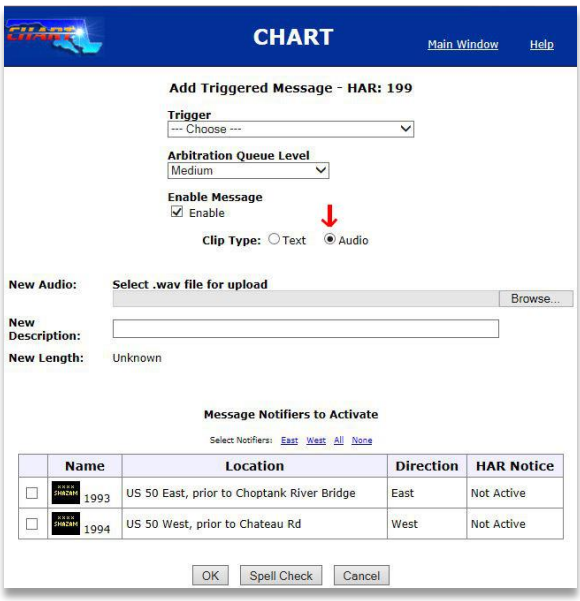


Figure 4-62 HAR Add Triggered Message Audio Upload

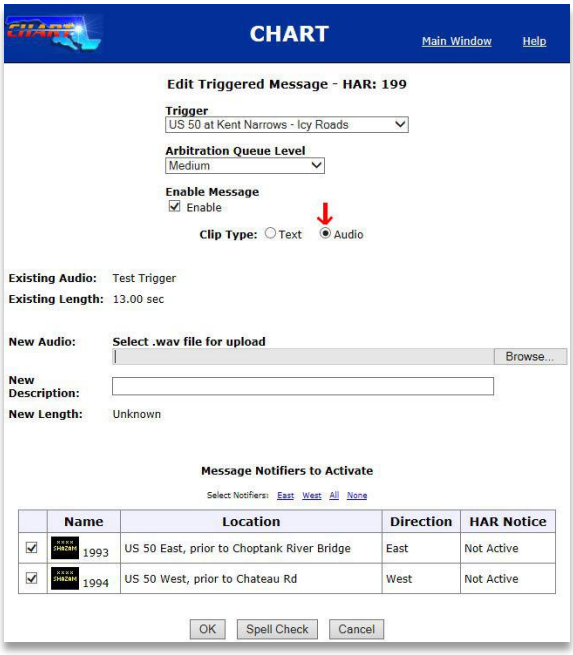


Figure 4-63 HAR Edit Triggered Message Audio Upload

3. HAR Stored Message Editor: The Add or Edit Stored Message Editor can be accessed from the Message Library Details page for a user with the Modify Message Library right. Both editors may be placed in Standard or Advanced mode for audio upload.

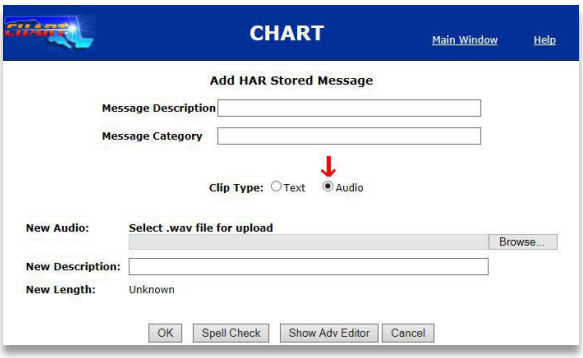


Figure 4-64 HAR Add Stored Message Audio Upload

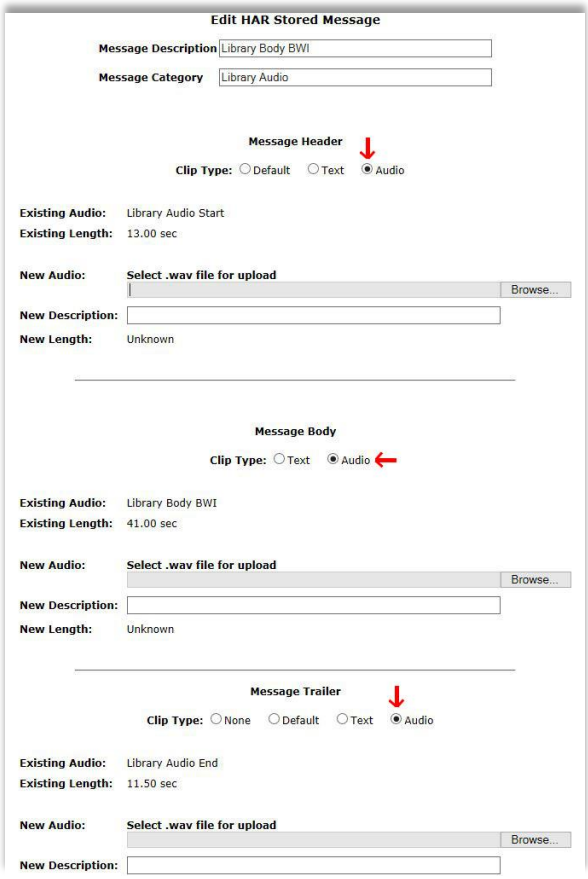


Figure 4-65 HAR Edit Stored Message Audio Upload

4. HAR RPI Editor: The Edit Response Plan Item HAR Editor can be accessed from the Event Details Response Plan section for a user with the Manage Traffic Event and Respond to Traffic Event rights. Editor may be placed in Standard or Advanced mode for audio upload.

Figure 4-66 HAR Edit RPI Message Standard Audio Upload

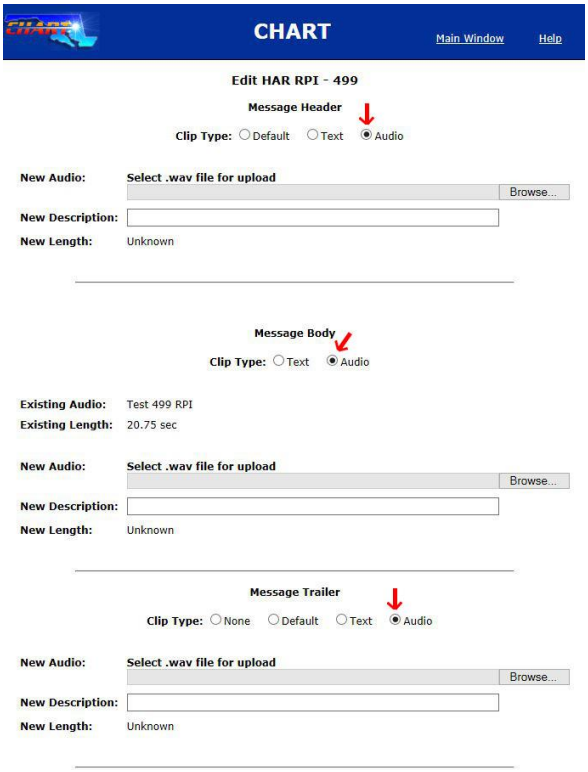


Figure 4-67 HAR Edit RPI Message Advanced Audio Upload

4.7 ATMS-887: NTCIP DMS: Consider Skipping FontStatus Check on Per DMS Basis

This PR adds a font management setting for NTCIP DMSs. Typically DMSs will use the normal "Process normally" option. DMSs which support font management but do not support the fontStatus synchronization element in the NTCIP MIB can use the "Bypass fontStatus control", and those which do not support font management altogether can use the "Bypass entirely"

option. (These options are listed in order of least risky (most preferred) to most risky (least preferred.) The "Bypass fontStatus control" option still attempts to download fonts, but it does not use the fontStatus MIB element to synchronize access to the fonts, so there is a risk that two systems (e.g., an ATMS in production and on training, or an ATMS in production and manufacturer software being used by Radio Shop) could attempt to manipulate fonts on the DMS at the same time. The "Bypass entirely" option does not attempt to check or configure fonts on the DMS at all, so the ATMS has to just assume that the font configured for the DMS matches what the ATMS has been told it has. The option is listed in the "Basic Settings" section of the DMS Details Page. See Figure 4-68.

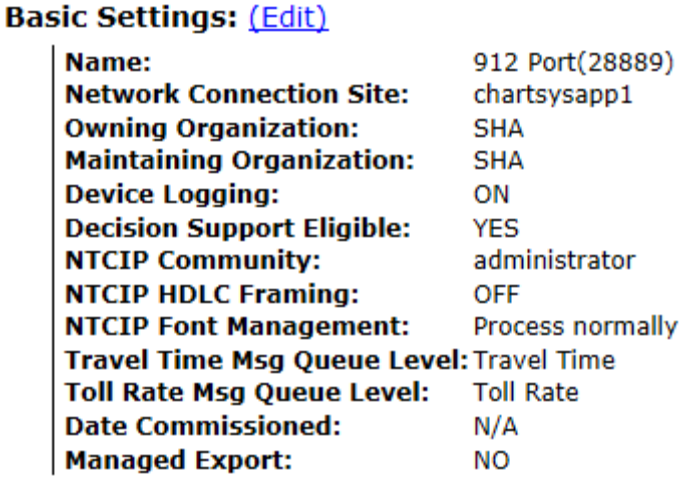


Figure 4-68. NTCIP DMS Font Management Option

The font management option can be configured as a DMS is being created, or at any time the basic settings of a DMS are being edited. See Figure 4-69.

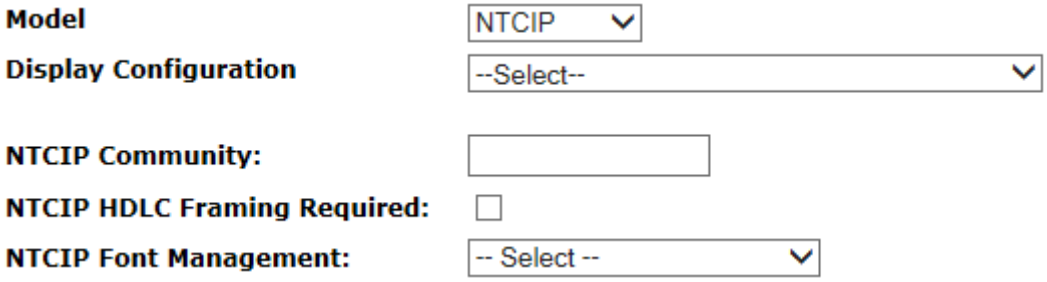


Figure 4-69. NTCIP Font Management Option Selection

The font management option also comes into play when copying a font from a live DMS when creating or editing a DMS Display Configuration. If the font is to be retrieved from a DMS which is accessible in the field, a checkbox indicates whether or not to bypass fontStatus control. (Clearly the third option of not managing fonts altogether on the queried DMS cannot be used, since retrieving the font is the very operation which is intended.) See Figure 4-70.

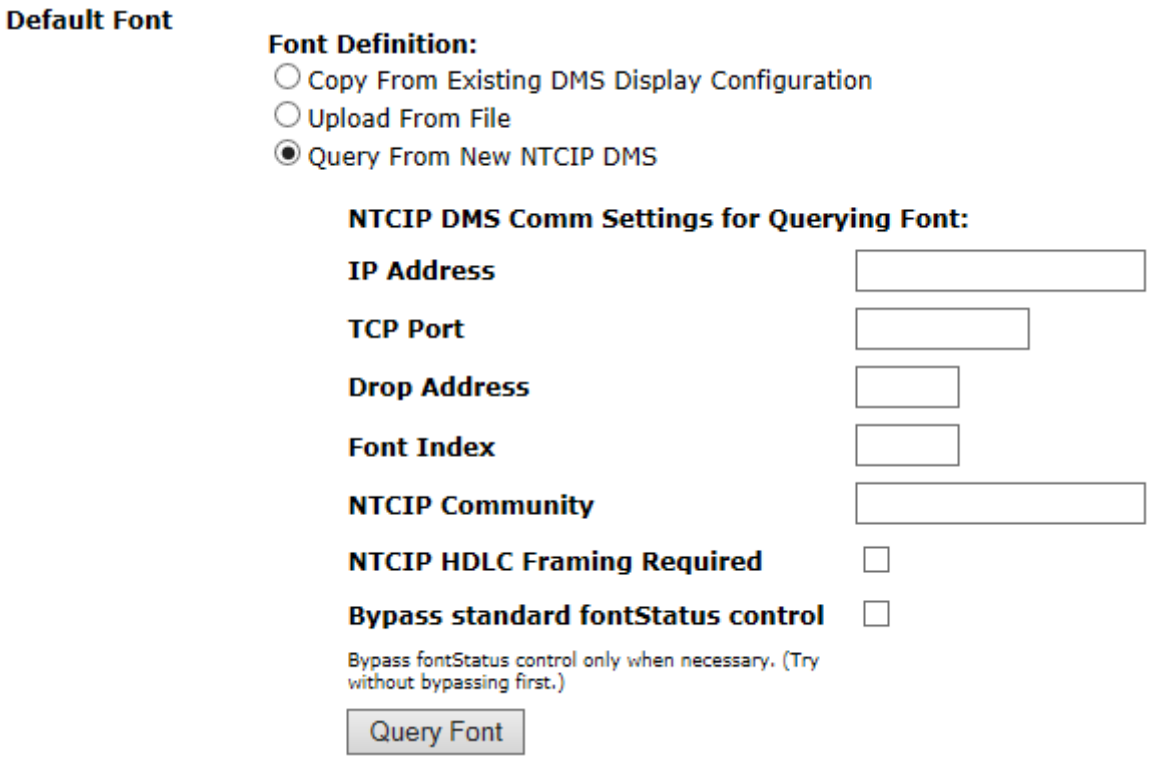


Figure 4-70. Font Management Option when Retrieving Font from DMS

4.8 ATMS-2281: NTCIP DMS Does Not Get Set to Hardware Failed

This PR adds evaluation of "Short Error Status" bits from NTCIP DMSs and allows those bits to contribute to the Hardware Failure status for NTCIP DMSs. Of the various bits that can be received, some always contribute to the Hardware Failure status, some never do, and two are configurable, according to this list, as agreed to by SHA and MDTA and their corresponding Radio Shops:

Comms error - process it
Power error - process it
Attached device error - process it
Lamp error - ignore it
Pixel error - process it
Photocell error - process it
Message error - process it
Controller error - process it
Temperature warning - configurable (process or ignore) via System Profile
Climate control error - configurable (process or ignore) via System Profile
Critical temperature error - process it
Drum sign rotor error - ignore it
Open door warning - process it
Humidity warning - ignore it

Whether Temperature warning and Climate control error contribute to Hardware Failure status are configurable via the System Profile, under DMS System Settings > DMS General Settings.

As noted in the description, when these settings are changed, even though the “ignored” status of the bit(s) are reflected immediately in the GUI, the Hardware Failure Status for each DMS will not be affected until the next time the DMS is polled. See Figure 4-71.

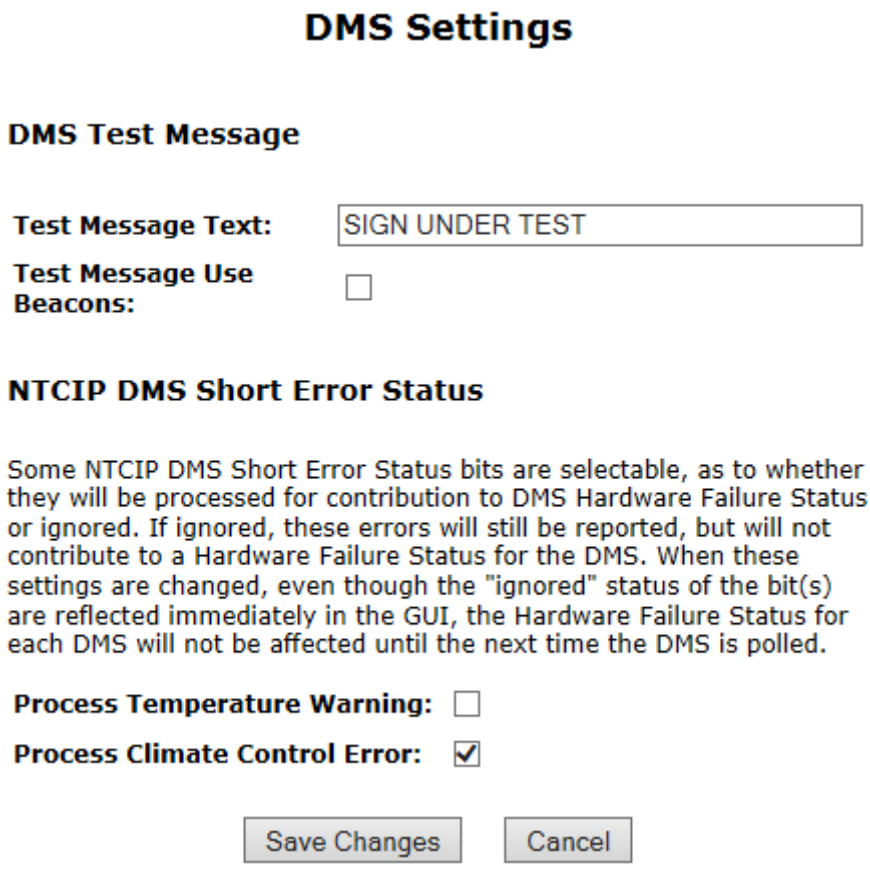


Figure 4-71. NTCIP DMS Short Error Status Settings

Short Error Status bit values are retrieved from the device on each poll. If any that are not ignored are set, the DMS is set to Hardware Failed, otherwise, the Hardware Failed setting is cleared. The bits detected are displayed on the DMS Details page. See Figure 4-72.

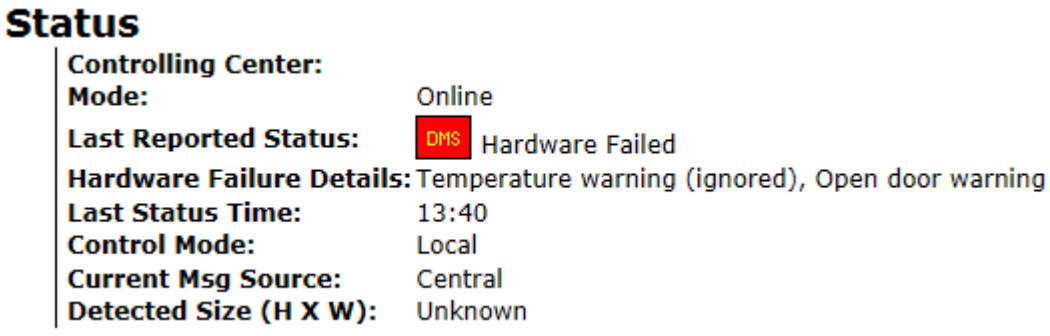


Figure 4-72. NTCIP DMS Error Bits on DMS Details Page

The Short Error Status bits are also shown in a new column on the DMS List Page. With customer concurrence, the bits are shown in the order they are located in the Short Error Status word, as it seems there is some prioritization within the word, with Comms error, Power error

first, Open door warning and humidity warning last, etc. Bits will be presented in the order shown in the list at the top of this section. This column is hidden by default, but can be selected for display in the Set Columns popup. This column is sortable and filterable. Filtering is simple: one can filter for presence of any one error bit (but not, for example, absence of one, or presence of one plus absence of another, etc.). See Figure 4-73. Note this list is filtered on Temperature warning (which is currently configured in the System Profile to be ignored). Note that DMSs which have only one or more ignored bits show as OK (black icon, no presence of a Hardware Failed indication) and DMSs which have one more processed bits show as Hardware Failed (red icon).

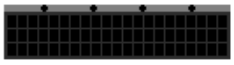
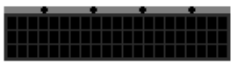
Description △ / Location	Model --Any--	Message --Any--	Status Online	Hardware Status Temperature warning (ignored)
DMS 1103 US 50 WEST AT AMERICAN LEGION RD	NTCIP		Online Hardware Failed	Power error Temperature warning (ignored)
DMS 3305 I-270 South, past Ex. 13 Middlebrook Rd.	NTCIP		Online Hardware Failed	Controller error Temperature warning (ignored) Climate control error
DMS 3317 I-95/495 I/L, (South) prior Ex. 20 MD 450	NTCIP		Online	Temperature warning (ignored) Drum sign rotor error (ignored)
DMS 3351 US 301 SB NORTH OF TIMOTHY BRANCH DR	NTCIP		Online Hardware Failed	Temperature warning (ignored) Climate control error
DMS 6607Port (28859) I-68 WEST PRIOR TO EXIT 39 US 40 NATIONAL HIGHWAY (WB)	NTCIP		Online	Temperature warning (ignored)
DMS 7719 I-70 East, 2 Mi West of Ex. 87 US 29	NTCIP		Online Hardware Failed	Temperature warning (ignored) Climate control error

Figure 4-73. Hardware Status in DMS List

4.9 ATMS-2601: Don't set DMS fontCharSpacing/fontLineSpacing when not applicable

By and large, this PR results in changes behind the scenes in background processing when configuring fonts on a DMS. There is no purpose in setting fontCharSpacing and fontLineSpacing for a Character Matrix sign. It is meaningless; the spacing between the characters (horizontally) and lines (vertically) is fixed by the physical location of the individual character elements. Likewise, setting fontLineSpacing for a Line Matrix Sign is meaningless: the vertical spacing between the lines is fixed by the physical location of the line elements. The

ATMS used to set fontCharSpacing and fontLineSpacing to zero on DMSs where the values do not apply. The NTCIP specification requires that implementers ignore this values when they do not apply, however, CHART has recently acquired DMSs that reject these settings. Therefore, from now on, the ATMS will not send a value of zero.

Since a value of zero now has special meaning ("don't set this value"), the GUI prevents the user from setting a character spacing of zero. (The GUI already prevents setting a line spacing of zero.) A character spacing of zero is not useful anyway - it jams the letters right up against each other (horizontally). This is shown in Figure 4-74. The range used to be 0 to 255. Values much more than three are not useful, therefore the list is cut off at 10 now.

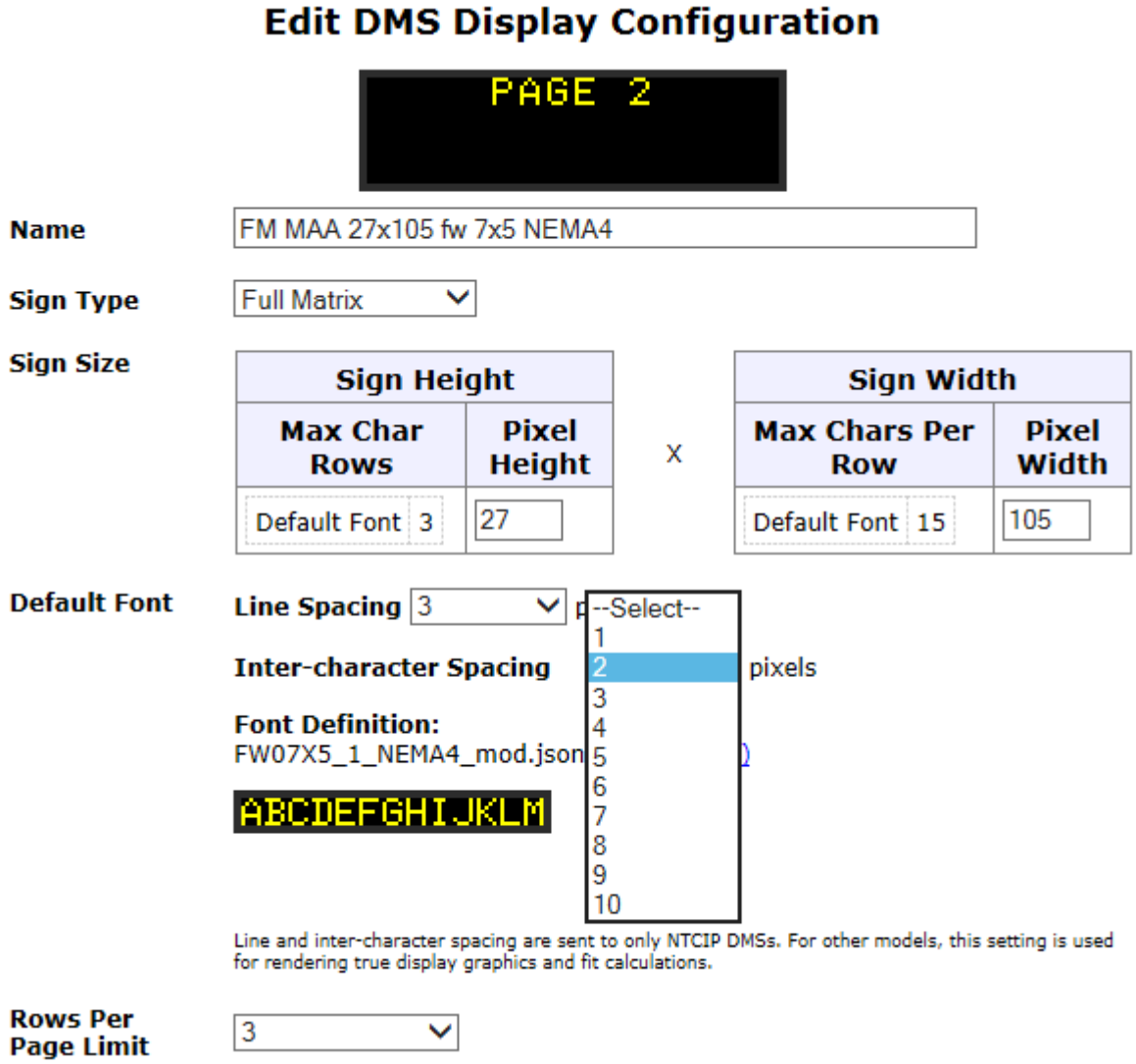


Figure 4-74. DMS Display Configuration Showing Inter-Character Spacing Range

4.10 ATMS-2523: Incorporate Skyline/Turnkey RVDS-based Decoder into ATMS

This PR adds support for video streaming to ATMS Monitors using the Skyline/Turnkey Remote Video Display Solution. This solution allows for streaming of video from ATMS Streaming Servers (SFSs) directly to ATMS Monitors.

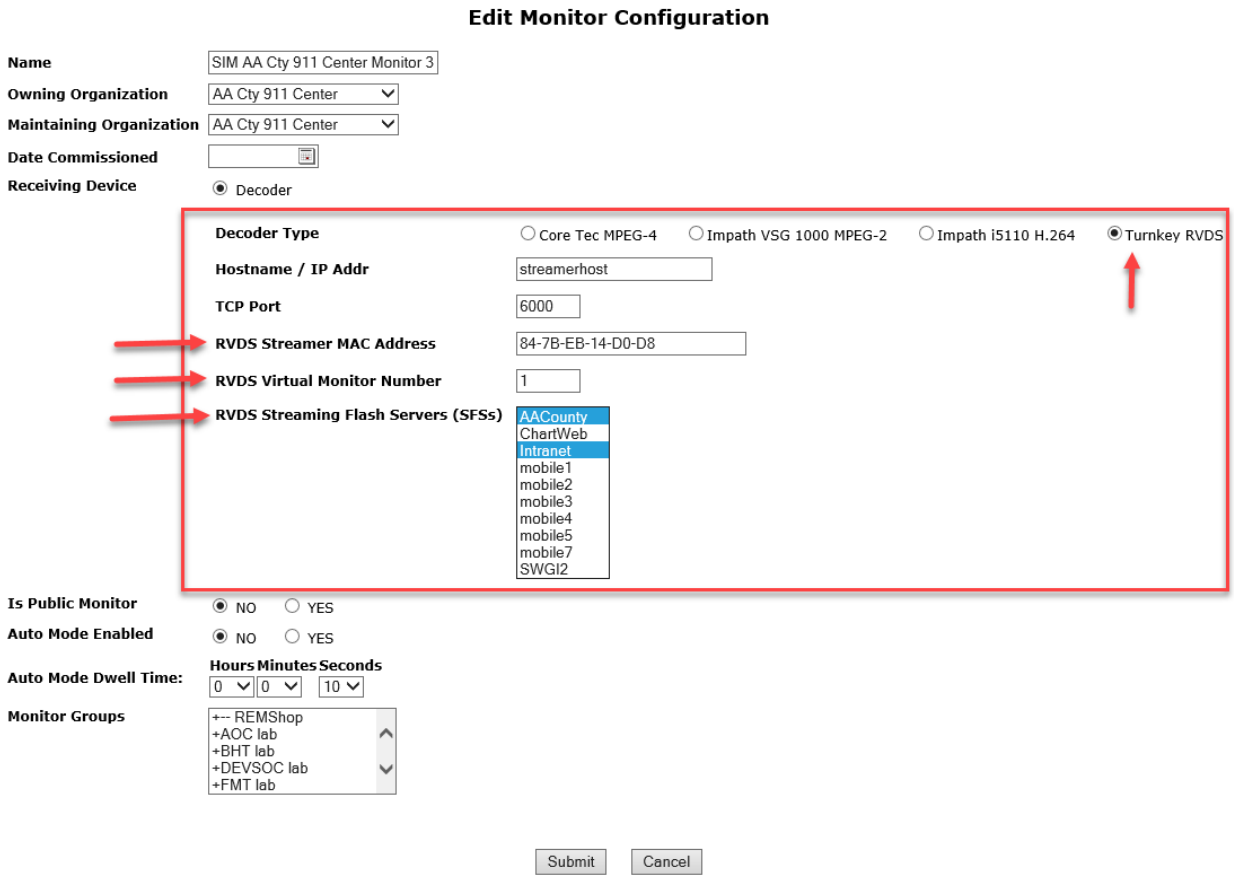


Figure 4-75 Add / Edit Monitor Configuration

A new **Decoder Type**, Turnkey RVDS, is being added. Unlike the other decoder types, this decoder type does not have a **Video Fabric** field, as cameras are not restricted by video fabric when displayed on a RVDS (like they are for other decoder types). The **Decoder Type** field, which was previously between the **Hostname/IP Addr** field and the **TCP Port** fields, has been moved up to the top of the section to reflect the fact that it affects the other fields including the presence of the **Video Fabric** field).

- **Hostname / IP Addr** is the hostname of the Turnkey Video Streamer Service
- **TCP Port** is the TCP port of the Turnkey Video Streamer Service
- **RVDS Streamer MAC Address** is the network adapter address of the Turnkey RVDS device, which is needed to play video via the Turnkey Video Streamer Service.
- **RVDS Virtual Monitor Number** is used to specify the location of the monitor image on the physical monitor. A RVDS device can be configured in the Turnkey Video Streaming Service to support from 1 to 16 video streams (although in practice, at this time, 8 concurrent video streams is the most that can be practically processed). Video streams are arranged in a grid pattern which depends on the number of monitors configured. A virtual monitor number of 1 is the top left position on the monitor (if more than one virtual monitor), or, if the RVDS is configured for a single virtual monitor, a value of 1

represents the entire monitor. For multiple monitors, the virtual monitor number location wraps from left to right and then down to the next row on the monitor. See the Turnkey RVDS User Manual for details.

- **RVDS Streaming Flash Servers (SFSs)** is a multi-select field whose values are matched against a camera's assigned SFSs to obtain a camera's URL for streaming. A camera can be displayed on a monitor only if it has a matching SFS.

4.11 ATMS-2751: Upgrade JWPlayer to 7.10.2

This PR upgrades the version of JWPlayer to 7.10.2.

5 DETAILED DESIGN

5.1 Hardware Detailed Design

There is no new hardware (servers, devices, etc.) deployed that is related to ATMS R18.

5.2 Software Detailed Design

5.2.1 Key Design Concepts

This section describes key design concepts for ATMS R18.

5.2.1.1 Flash Replacement

The following design concepts apply to more than one of the Flex applications in the CHART ATMS GUI:

There are currently the following Flash-using applications in the CHART ATMS GUI:

- **Home Page App**: Events, Resources, and Alerts tabs on the Home Page. This is being replaced in R18.
- **Edit Location App**: Form allowing the user to specify a location. Located on the Create Events tab on the Home Page, and on various popups used when specifying the location for any new or existing object in the system. This is being replaced in R18.
- **Event Launcher App**: The bottom portion of the form on the Create Events tab of the Home Page. This includes the Potential Duplicate Events list. It can also be invoked in a popup from the Comm Log or Pending Event List. This is being replaced in R18.
- **Audio Recorder App**: Used exclusively from the HAR Editor. This is being removed in R18 along with any user profile settings. There is an existing method to upload audio files recorded in an external program, and users may continue to utilize this method.
- **JWPlayer**: This is a third-party tool which uses Flash Player to display video streamed in the RTMP streaming format. This is NOT being replaced in R18, as changing the video streaming protocol is out of scope, and if/when it is changed, JWPlayer could still be used to display HTML5 streaming video (likely with minor changes in ATMS GUI code).

The Flex applications that are being replaced in R18 send requests only to the CHART ATMS GUI Servlet. They do not communicate with the CORBA services or any other web services, and they do not use the database directly. They do communicate with the enclosing web page via a JavaScript interface. As they are relatively isolated in the system, the impact of design and implementation changes is quite limited. Changes are easily tested, requiring at most a restart of Tomcat, and sometimes may only require clearing the JavaScript cache and reloading the page to test.

The requests that the Flex applications currently use to get data from the servlet return data in the XML format, because Flex contains native support for parsing XML. In JavaScript, however, the JSON format has advantages over XML. First, it is trivial to parse JSON using JavaScript. Second, JSON is much more compact than XML, so less data is transmitted, leading to better performance and less network bandwidth usage. Therefore, the requests supplying data will be converted to JSON where applicable.

In the Home Page App, the Events, Resources, and Alerts views each contain tabbed views, and each tab contains a list / data table. The Event Launcher App contains a similar list to show the Potential Duplicate Events. Unlike the lists displayed in the Working Window, the lists in the Home Page must be updated dynamically because the Home Page is not usually reloaded / refreshed. (One exception is if the user attempts to log out but there are controlled resources, at which point the Home Page is reloaded to show that page). In typical usage, however, the Home Page remains displayed for the entire duration of the user's login session.

There are a number of free third-party JavaScript libraries for displaying dynamic tabular data. Most likely, several of these libraries could display tabular data with a similar interface to the existing Flex implementation, so there could be multiple viable options. One of the leading libraries (which is flexible, well-supported, and free) is DataTables (https://datatables.net/). This library (like many others) is built on the JQuery JavaScript library. The CHART ATMS GUI will use DataTables as a first option unless it proves to be problematic.

Over the years, JQuery (https://jquery.com/) has become the de facto standard for cross-platform JavaScript libraries on the Web, with a market share of over 70% of all sites. The CHART ATMS GUI uses the Prototype library, which is an alternative library of the same kind as JQuery. (In 2008 when the ATMS GUI started using a cross-platform library, Prototype and JQuery were more evenly matched). It is possible to use both JQuery and Prototype on the same web page. In general, it might be risky to globally change the ATMS GUI to use both JQuery and Prototype on all web pages, as there might be conflicts; however, the Home Page is a single, isolated page. Other pages could perhaps use JQuery and/or DataTables as well if the need arises.

JQuery has a companion library for user interface components, called JQueryUI (https://jqueryui.com/). This library contains some useful controls that may be of immediate interest in R18:

- Autocomplete: may be useful for replacing the custom CompletionInput Flex control on the Edit Location form
- Controlgroup: may be useful for grouping inputs on the Edit Location page
- Tabs: could be useful for the sub-tabs for the Events, Resources, and Alerts tabs. Perhaps the main buttons at the top of the Home Page could be retrofitted to use this for greater simplicity.

- Tooltip: may be useful for form fields

As new GUI user interface components are added, developers will need to coordinate to ensure that styles are consistent across the different pages. This is especially true in R18, as different Flex applications are being replaced which share the same component types.

As an implementation strategy, it may be good to keep the Flex applications at the beginning of implementation and add new tab buttons for the new views. This would allow comparison of old and new functionality and the data displayed in the old and new views.

Framework Investigation: AngularJS

AngularJS (https://angularjs.org/) is a JavaScript library (written by Google) that dynamically manages a portion of a web page. An AngularJS "application" replaces and updates content within a container element to display one or more "views". It is designed to support Single Page Applications, where an enclosing page is loaded once and the content within that page is updated without reloading the page. It rebuilds the HTML Document Object Model (DOM) as necessary to make that happen, and also manages the browser history aspect of the transitions between views. However, it is not necessary to use more than a single view, and even with only one view there are useful features. It uses a Model View Controller design pattern where each "view" is based on a relatively simple HTML template with directives which AngularJS uses to render the view appropriately. The Model (called a "scope" in AngularJS) contains data represented in the view, and the Controller manages the data. Data binding is used to update both the view or model automatically if the other changes. The framework offers dependency injection which allows the components to be replaced easily, making unit testing easier, as test drivers can be easily constructed to provide alternate functionality.

Applicability to the CHART GUI: The Home Page is similar to a Single Page Application, in that it is not reloaded normally while the user is logged in (actually it is reloaded if the user attempts to log out and there are controlled resources, but usually it is not reloaded). The main content area *could* be managed as a Single Page Application using AngularJS, where clicking on each tab displays a different view. The easier solution is to not use a framework, keep the HTML for all of the tabs in memory, and show/hide the tabs when applicable. This is discussed below in the Home Page App section.

Another place where AngularJS might be of use is in the Edit Location form, or in any other complex form in the system. The data binding functionality, separation of model/view/controller logic, and improved testability would all be very useful.

Angular1 vs. Angular2: Angular1 has been in use for years, and has more community support and knowledge base. Angular2 is relatively new, it requires a new language (TypeScript 6), and seems like it has a larger learning curve. Angular2 is reported to be faster, however. Development using Angular1 is probably easier and preferable to Angular2 for R18.

5.2.1.1.1 Home Page App

The Home Page Flex App represents the contents displayed under the Events, Resources, and Alerts tabs of the Home Page. The buttons above the view, when clicked, show (or hide) the Home Page Flex app and cause the appropriate view within the Flex app to be displayed. The Events, Resources, and Alerts are bundled into a single Flex application, even though they are independent views. (It was probably done this way to make use of common utilities and framework, and to cut down on page load times).

In R18, the existing buttons can still be used to switch between views, showing or hiding DIV elements containing the appropriate views. There are functions in both Prototype and JQuery to show / hide elements, but what they do under the covers is to modify the CSS "display" style. The elements remain in memory (in the HTML Document Object Model), but are just not displayed. Showing or hiding the lists is likely preferable to removing them from the HTML DOM and re-creating them when they are shown again (perhaps using a framework) because reloading them would require reinitializing them and getting the data.

The Home Page App does not seem complex enough to warrant the introduction of a new application framework for R18. The three views are independent, and all of them together should not contain an overwhelming amount of data to store in memory. (If the amount of data was a problem, DataTables has strategies where data can be loaded in a deferred manner only if it is viewed).

The DataTables and JQueryUI (Tab control) libraries can provide most of the user interface elements for the Events, Resources, and Alerts views. HTML5 elements can also be used. Requests will return JSON for the tabular data, as it is more compact and easier to process than XML.

5.2.1.1.2 Edit Location App

The Edit Location App contains some of the more complex logic in the ATMS GUI, as the form issues ten different requests, and changing the field selections triggers the population of other fields. In the case of the Route field, the list has different data depending on whether showing routes by name or number, and each item in the list can represent more than one route from the GIS data.

The requests sent by this form will be changed to return JSON instead of XML. This may provide a significant performance benefit over the existing Flex form, particularly when loading the Routes and Intersecting Features, which can be quite large and has been observed to take a long time to transmit.

Due to the complexity of this form, the form will be split into more of a Model-View-Controller design. In this design, the Model represents the data in the form and the user's selections, and it keeps the state consistent within itself. The View contains the HTML elements. The Controller has the logic to manipulate the form data, etc.. The Flex version of this form mixed most of this functionality within the same code, while other parts of the form (like the intersecting features) are more cleanly separated. The Flex code has ActionScript (.as) files representing the data stored in the form, and these may be useful to port directly to JavaScript as building blocks.

Due to the complexity, the AngularJS MVC framework will be used for this form. This framework is designed to handle the coordination between model and view, whereas implementing it by hand would require more code to fire and handle events and update the model. The drawback for using such a framework is the learning curve. Maintenance of this code would likely be harder due to the learning curve and cryptic-looking code and "magical" behavior, but on the other hand easier due to the reduction of the amount of code.

The Edit Location Flex App uses a custom third party CompletionInput control that is used for the Alias, County, Region, Route, Intersecting Route, and Exit fields. The control is a combination of a text input and a list box and behaves differently depending on whether the "must pick" flag is set to true. This control will require some custom code in JavaScript to attempt to replicate the functionality. JQueryUI has an AutoComplete control that is similar and may be customizable to act like CompletionInput (or perhaps close enough).

JQueryUI may have other useful components and behaviors for this form, including Controlgroup, Tabs, and/or Tooltip. JQueryUI also has a Resizable behavior which could be useful to allow the user to resize the DIV containing this form relative to the map (the Flex version of the form had a hard-coded width and if it was too narrow it would cut off the route / exit names, whereas if it was too wide it would reduce screen size for the map too much).

The Edit Location form calls into JavaScript (and is called from JavaScript) to interact with the map, and it will need to continue to do so after it is converted to JavaScript.

5.2.1.1.3 Event Launcher App

The Event Launcher App is fairly simple, but it does have XML requests that will be converted to JSON.

This form contains the Potential Duplicate Events list, which could use DataTables to display the potential duplicate events.

The Flex version of this form also makes use of the CompletionInput control for the Field Unit field. Perhaps JQueryUI's AutoComplete could be used for this or the customized version of it that the Edit Location form will need to use.

This form should use similar controls and styling for the Potential Duplicate Events List as the other lists on the Home Page, and other fields should be compatible with the Edit Location form fields.

5.2.1.1.4 Audio Recorder App

The HAR Editor form option for recording audio will be updated to remove the option as well as the Flex specific form page and classes related to audio recording. The User Profile setting for audio recording selection will also be removed. No other changes to the existing audio file upload form or supporting classes are planned in R18.

5.2.1.2 Other WO10 PRs

5.2.1.2.1 ATMS-839: DataExporter attempts to send more than the max allowable lanes in a traffic event

There are no significant changes to this PR. The goal of this PR is to increase the number of lanes in a traffic event that can be exported to both CHARTWeb and IntranetMap. The number of lanes in a traffic event are increased to a maximum of 64 instead of 32 lanes that are currently supported. This can be achieved by changing the DataExporterService XSD to support 64 lanes instead of 32 lanes.

5.2.1.2.2 ATMS-887: NTCIP DMS: Consider Skipping FontStatus Check on Per DMS Basis

There are no major design decisions for this PR. The effort is to add a three-way parameter to the IDL for each DMS, make the parameter viewable and configurable via the GUI, persist it to and depersist it from the database, and pass it down to the correct levels of the protocol handler so it can make decisions based on the flag. If the parameter indicates to bypass fontStatus control, the protocol handler does not attempt to get or set the fontStatus parameter, and the protocol handler assumes (with a little risk) that it is the only central station manipulating fonts at the time. If the parameter indicates to bypass font management entirely, the protocol handler never attempts to read or set any fonts on the DMS. The ATMS must assume (with some risk) that the font configured into the DMS hardware matches the font configured for the DMS software object. Upon customer direction, the DMS NTCIP Protocol Conformance Tester does not expose these settings, and forces all font manipulation to be processed normally. Therefore, any DMS for which the settings are necessary cannot be said, knowingly or unknowingly, to have passed the conformance test.

5.2.1.2.3 ATMS-2200: Duplicate Activations Sent to LCP

There are no significant changes to this PR. The goal of this PR is to prevent sending duplicate requests when performing an action (i.e. Activate, Deactivate, Queue, DeQueue) on the Permit, which causes subsequent problems with archiving in LCP.This can be achieved by disabling buttons and avoiding requests on the links. When the user clicks on the Activate, Deactivate, Queue, and De Queue buttons, then the button is disabled until a response is received from the

LCP web service. When the user clicks on the Activate, Deactivate, Queue, and De Queue links, then any subsequent clicks on the links will prevent sending requests to the web service until a response is received from the LCP web service. Since these actions are specific to the GUI, there are no changes at the server level.

5.2.1.2.4 ATMS-2281: NTCIP DMS Does Not Get Set to Hardware Failed

There are no major design decisions necessary for this PR. The Short Error Status bits were already being retrieved, but were not evaluated for contribution to the Hardware Failure status for an NTCIP DMS, nor were the bit displayed on the GUI. Both of these shortcomings have been overcome with implementation of this PR. The processing is very routine.

The original plan was that all Short Error Status bits would contribute to the Hardware Failure status for an NTCIP DMS (any single bit on at all would cause a Hardware Failure), but after looking at the list, the customer was consulted, and it was decided that some should be ignored. Furthermore, there was uncertainty with two of the bits (Temperature warning and Climate control error), so was decided these bits would be configurable. The initial thought was that the configurability would be accomplished via the DMS Service properties file, but later it was decided that it should be accomplished via the system profile, so that the GUI as well as the server would know which bits are processed and which are ignored. (The GUI marks ignored bits with "(ignored)" and does not adorn actively processed bits in any way.)

5.2.1.2.5 ATMS-2523: Incorporate Skyline/Turnkey RVDS-based Decoder into ATMS

This PR adds support for the Turnkey Remote Display Video Solution (RVDS) into the ATMS. The RVDS is comprised of a Video Streaming Device (VSD) connected to each monitor and a Video Streamer Service (VSS) which commands the VSDs. The VSD is a small single board computer (currently a Raspberry Pi) which is connected to a monitor. The VSD operates without manual intervention. Upon booting up, the VSD calls out to connect to its configured VSS, and that connection, which is held open indefinitely via "keep-alive" packets, is used by the VSS to command the VSD to play or stop playing a video stream which is accessible to the VSD. (The video stream need not be accessible to the VSS.)

The VSD can stream a small number of simultaneous video streams on its connected monitor. Currently, due to processing limitations, up to 8 streams can be supported. These are arranged in grid-like fashion on the monitor. Aside from displaying just one stream on a full physical monitor, the other most likely possible configuration is as a "quad" monitor, displaying four streams, one on each of four quadrants of the physical monitor. In this case, in the ATMS the physical monitor would be modeled as four separate software "Monitor" objects, each independently controlled via the ATMS. All four would have the exact same configuration except for the virtual monitor number (1 through 4). The manufacturer indicates that the VSS manages and prevents any contention issues in commanding multiple virtual monitors on the same physical monitor at the same time.

Piggybacking on current design, the RVDS is modeled as a "decoder", even though the VSD is distinctly different from other supported CODECs. In particular, the RVDS and the VSD has no concept of video "fabrics", and can display a video stream from any fabric, provided the stream is reachable. Therefore, an RVDS Monitor has no fabric. To support identification of which video streams are reachable, an RVDS monitor can be configured to accept streams from any number of Streaming Servers (currently also known as Streaming Flash Servers (SFSs)).

CHART ATMS Video software only has to check that the desired video source is configured to stream on one of the SFSs that the monitor is configured to be able to reach. The video streaming template for a matching SFS is used to construct the video stream URL to be streamed. The ATMS then commands the VSS, using a webservices interface, to command the VSD to play the video. (The video stream URL need not be reachable by the VSS.)
The video streaming URL templates are typically of the form or similar to the form "rtmp://<*host*>/rtplive/<*streamID*>". The "<*streamID*>" is generally the CHART ID of the camera (though an alternate ID can be configured). The "<*host*>" is the SFS's internal hostname or IP address if the SFS is configured to be in the Internal Zone, or the SFS's external hostname or IP address if the SFS is configured to be in any other zone (other zones are SWGI, MVIEW, and Public).
The VSS webservice command parameters are passed via a JSON string named "data". The JSON string is constructed using the FasterXML Jackson library, which was added to the CHART ATMS baseline in R15. The same library is also used to interpret JSON data responses from the VSS.

5.2.1.2.6 ATMS-2751: Upgrade JWPlayer to 7.10.2.

There are no major design changes necessary for this PR. To be compliant with the latest version of JWPlayer, the script file that interacts with JWPlayer may be modified. Some scripts are removed to stop supporting cameras without an internet connection, due to JWPlayer license restrictions.

5.2.2 Packaging

5.2.2.1 CHART ATMS

This software design is broken into packages of related classes. Table 5-1 shows each package that is new or changed to support the Release 18 features.

Table 5-1. CHART ATMS Packages

Package Name	Package Description
CHART_Build_COTS.apache.commons	Upgrade Velocity engine from 1.6 to 1.7 and Velocity Tools from 1.4 to 2.0 (ATMS-2426)
CHART_Build_COTS.apache.velocity	Upgrade Velocity engine from 1.6 to 1.7 and Velocity Tools from 1.4 to 2.0 (ATMS-2426)
CHART2.CameraControlModule	Add support for RVDS streaming (ATMS-2523).
CHART2.DMSControlModule	This package is modified to support PRs ATMS-887, ATMS-2281, and ATMS-2601.
CHART2.DMSProtocols	For some or all of ATMS-887, ATMS-2281, ATMS-2601
CHART2.MonitorControlModule	Add support for RVDS streaming (ATMS-2523).
CHART2.Utility	Add support for RVDS streaming (ATMS-2523).
CHART2.Utility.ObjectCache.video	Add support for RVDS streaming (ATMS-2523).
CHART2.VideoUtility	Add support for RVDS streaming (ATMS-2523).
CHART2.webservices.base	Upgrade Velocity Engine from 1.6 to 1.7; Velocity Tools from 1.4 to 2.0
CHART2.webservices.exportlistenermodule	WO12 compatibility updates

Package Name	Package Description
CHART2.webservices.laneeditormodule	Edit Location (ATMS-2392)
CHART2.webservices.signalmodule	Edit Location (ATMS-2392)
chartlite.data.dms	Process NTCIP short error status (ATMS-2281)
chartlite.data.eventresources	Flash home page event resources (ATMS-2382)
chartlite.data.fitm	Flash Edit Location (ATMS-2397)
chartlite.data.location	Edit object location (ATMS-2391, ATMS-2398)
chartlite.data.trafficevents	TrafficEvent home page flash replacement (ATMS-2377)
chartlite.data.video	Add support for RVDS streaming (ATMS-2523).
chartlite.images.trafficevents	Event icons Display Event Lists (ATMS-2377)
chartlite.includes	Home Page Edit Launcher and others (ATMS-2389, ATMS-2390, ATMS-2391)
chartlite.scripts	Function added to the script to prevent sending another action request to the server for ATMS-2200.
chartlite.scripts.angular	New package to support angular's use in Edit Location (ATMS-2391 through ATMS-2406)
Chartlite.scripts.CHARTLayers	Edit Location (ATMS-2392), ATMS-2395, ATMS-2406)
Chartlite.scripts.completioninput	New package to support JavaScript based on angular functions (ATMS-2395)
chartlite.scripts.datatables	New package to support JQuery for In/Out Service (ATMS-2381)
chartlite.scripts.homepage	This folder has the functionality related to the Homepage Events List, and Resources List.
chartlite.scripts.jquery	New package to support Edit Location and others (ATMS-2403)
chartlite.scripts.jquery-ui	New package to support JQuery
chartlite.scripts.jwplayer	JWPlayer scripts are modified to support the version 7.10.2. Some files are removed to stop supporting the cameras without internet connection(ATMS-2751).
chartlite.scripts.trafficevents	New JavaScript file is added to support the functionality of Create Event Form (ATMS-2389, ATMS-2390).
chartlite.servlent.dms	NTCIP font management (ATMS-887)
chartlite.servlet	Add support for RVDS streaming (ATMS-2523).
chartlite.servlet.alerts	Flex home page alerts (ATMS-2384, ATMS-2385, ATMS-2386, ATMS-2387, ATMS-2388)
chartlite.servlet.eventresources	Flash Event Resources (ATMS-2380, ATMS-2381, ATMS-2382, ATMS-2383)
chartlite.servlet.har	Remove Flex Audio Recorder App (ATMS-2611)
chartlite.servlet.templates	Remove Flex Audio Recorder App (ATMS-2611)
chartlite.servlet.trafficevents	Flash duplicate event list (ATMS-2379, ATMS-2389)
chartlite.servlet.travelroutes	Edit Location Flash – Main Route (ATMS-2397)
chartlite.servlet.usermgmt	Update system profiles for NTCIP short error status (ATMS-2281)
chartlite.servlet.video	RVDS support (ATMS-2523)
chartlite.servlet.video.sink	Add support for RVDS streaming (ATMS-2523).
chartlite.servlet.video.source	Add support for RVDS streaming (ATMS-2523).
chartlite.template.tssmgmt	Edit Location (ATMS-2392)
chartlite.template.usermgmt	Homepage Flex app (ATMS-2404)
chartlite.template.videomgmt	Add support for RVDS streaming (ATMS-2523).
chartlite.template.xml	Removed XML methods in favor of JSON

Package Name	Package Description
chartlite.templates	Function added to the template to prevent default event on the links for ATMS-2200.
chartlite.templates.alerts	Remove home page flex app (ATMS-2404)
chartlite.templates.aliasmgmt	Edit Location (ATMS-2392)
chartlite.templates.dssmgmt	Edit Location (ATMS-2392)
chartlite.templates.eventresources	Remove home page flex app (ATMS-2404)
chartlite.templates.harmgmt	Edit Location (ATMS-2392)
chartlite.templates.homepage	This folder has the templates related to the Homepage Events List, Alerts List and Resources List.
chartlite.templates.onoffdevice	Edit Location (ATMS-2392)
chartlite.templates.shazam	Edit Location (ATMS-2392)
chartlite.templates.trafficevents	Buttons disabled after the click for ATMS-2200.
Interfaces/XSD/DataExporter/ATIS-Local.xsd	Increased the lane limit to a maximum of 64 instead of 32 for ATMS-839.

5.2.3 Assumptions and Constraints

5.2.3.1 *ATMS*-2377 through ATMS-2406, ATMS-2412, ATMS-2611 Flash/Flex migration

Assumption: The HTML5 re-implementation of Flash GUI objects will be performant in all user environments

Constraint: Operators can no longer use the ATMS to record HAR messages

5.2.3.2 ATMS-839 DataExporter Lane Configuration

Constraint: Creation of a roadway configuration with more than 64 lanes violates the interface specification and may again cause consumers (e.g. RITIS) to reject the message.

5.2.3.3 ATMS-887 NTCIP DMS Font Check

Constraint: Administrators must manually verify fonts on DMSs where the font check is disabled

5.2.3.4 ATMS-2281 Use NTCIP DMS Short Error Status

Assumption: Operators will be trained on how to handle DMSs that now show a hardware failed status

5.2.3.5 ATMS-2601 Font Char/Line Spacing

Assumption: DMSs that previously ignored unneeded character or line spacing will not be affected by their absence

5.2.3.6 ATMS-2523 RVDS

Assumption: RVDS equipment will perform at a level sufficient for operational needs.

5.2.4 Use Case Diagrams

The Use Case Diagrams (UCDs) below depict new and modified functionality for CHART ATMS R18. The use case diagrams exist in the Enterprise Architect design tool in the chartdesign project, under the CHART-ATMS-R18 folder.

5.2.4.1 R18 Use Cases UCD

R18 is primarily a technology upgrade for the user interface and video display with minor changes to other sub-systems so there are no changes to CHART use cases.

5.2.5 System Interfaces Design (IDL)

For convenient viewing, new and modified IDL designs are included in a separate document for viewing with a browser. Unzip the file CHART-ATMS-R18-Design-HTML.zip. Open the file index.htm in the top-level directory. See the example below for where to find links to the IDL class diagrams.

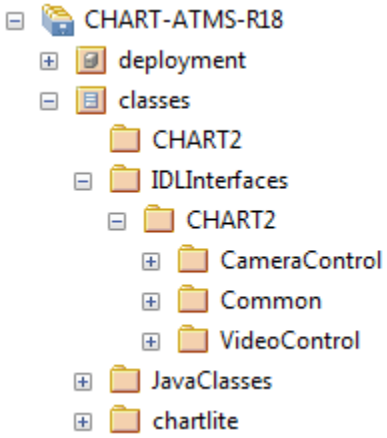


Figure 5-1. Where to Find IDL Interfaces Classes in HTML Design

5.2.6 Package Designs

Because this release consists only of relatively simple and straightforward PR fixes, there are no package designs for R18. Normally, new and modified package designs are included in a separate document for viewing with a browser.

5.3 Internal Communications Detailed Design

The following diagram depicts the high-level communications/interactions among ATMS and other CHART and external components.

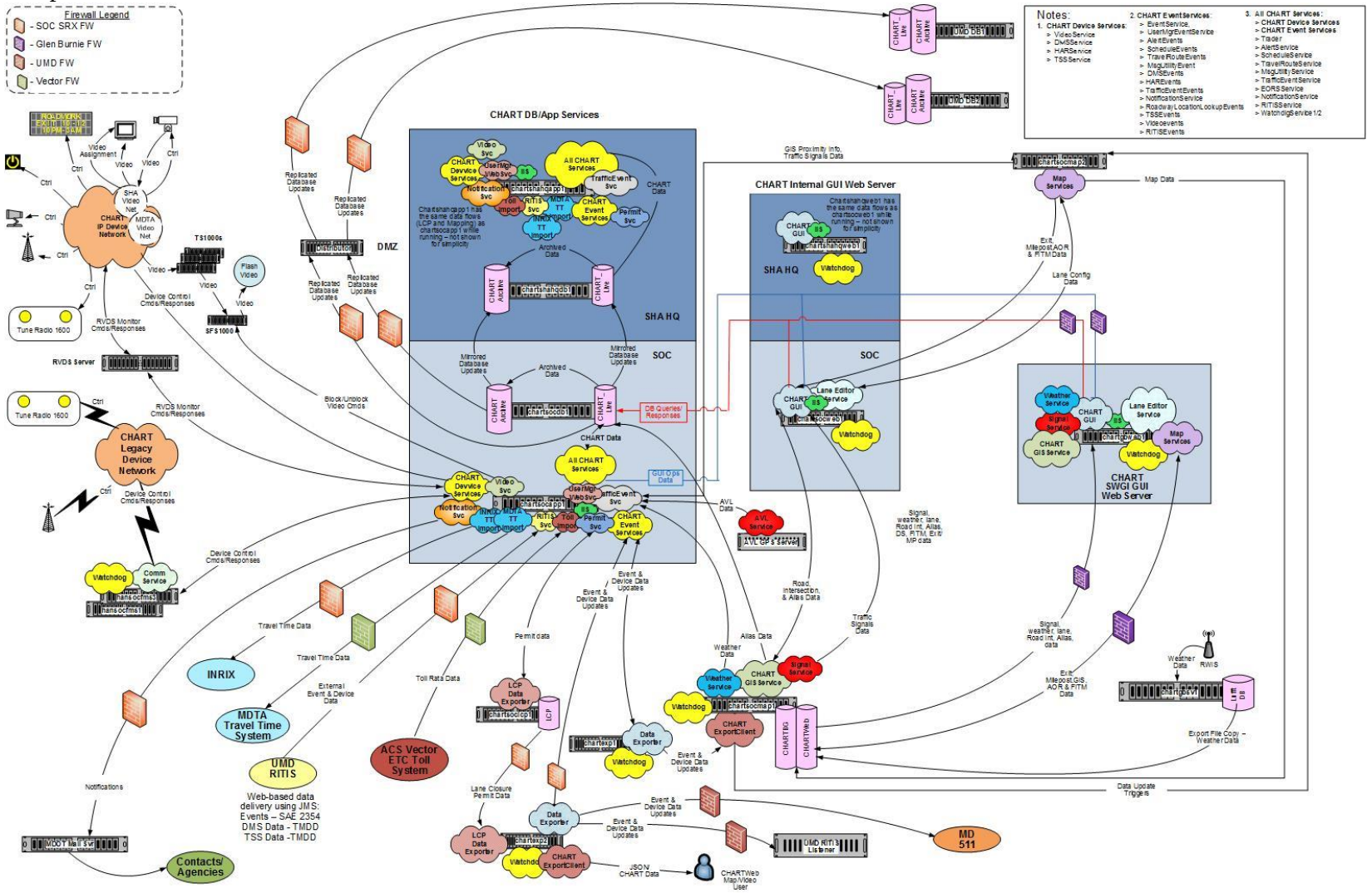


Figure 5-2 CHART ATMS Detailed Data Flow

6 EXTERNAL INTERFACES

This section describes the external interfaces utilized by CHART ATMs. There are no high-level interfaces being added or modified in Release 18 of CHART ATMS. See Figure 6-1.

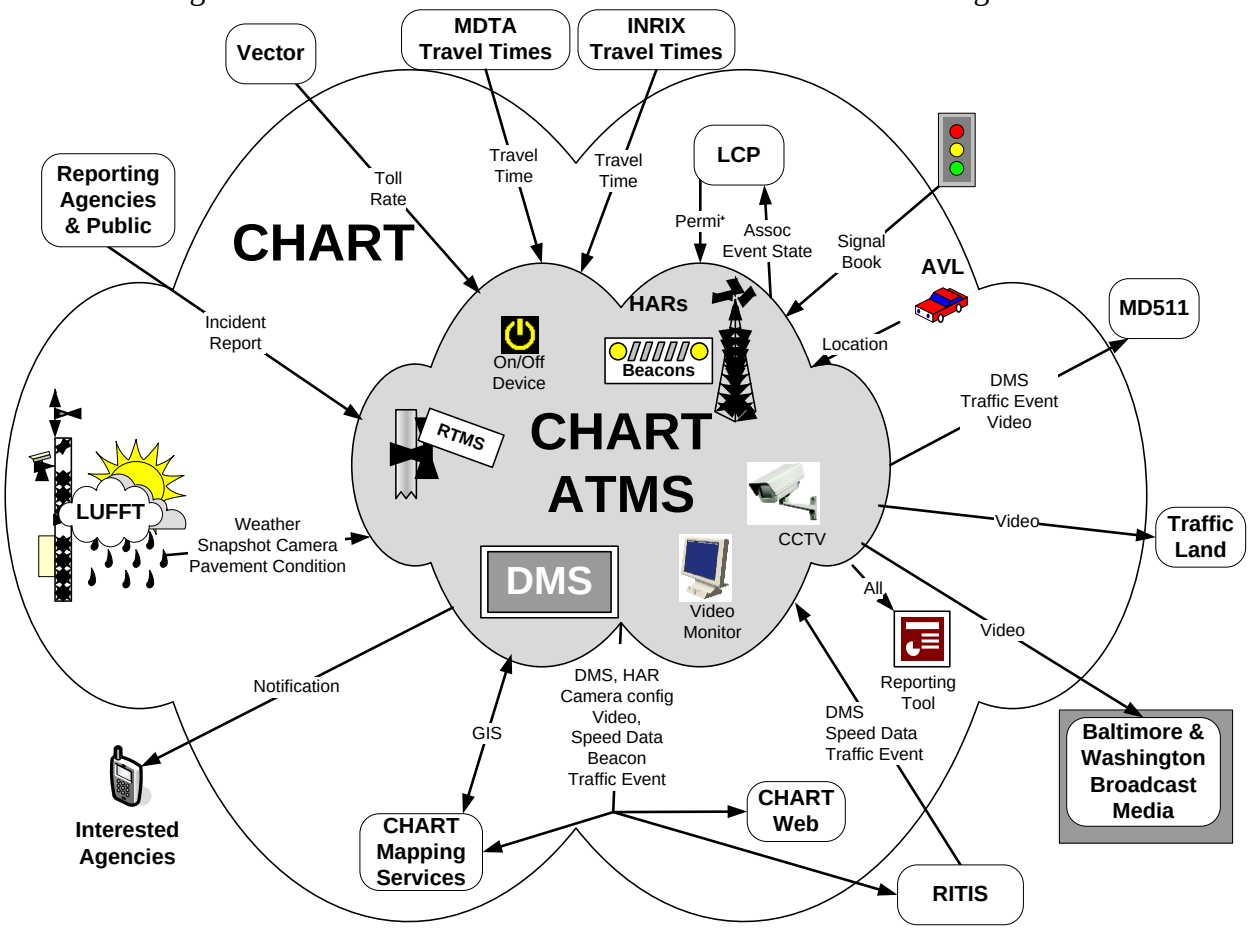


Figure 6-1. CHART and External Interfaces

6.1 Interface Architecture

For ATMS R18, the only external interface change is a minor upgrade to the existing traffic event export so it handles up to 64 roadway lanes.

6.2 Interface Detailed Design

For ATMS R18, there are no changes to the external interface designs.

7 SYSTEM INTEGRITY CONTROLS

This section describes the security and integrity controls being added or modified in Release 18 of CHART ATMS. Features being added for CHART ATMS Release 18 do not change security aspects of the CHART ATMS.

Appendix A Mapping to Requirements

The table below shows how the new and modified requirements in the CHART R18 Requirements document map to elements contained in this design.

Table A-1. Mapping to Requirements

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
ATMS-839	BR-1.1: System shall allow the user to specify 64 lanes for a traffic event. Different lane types in ATMS are Traffic Lanes, Shoulder, Collector/Distributor, Tunnel Lane, Toll Lane, Median, Double Yellow lines, Ramps, Merge Lane, Turn Lane, and Acceleration/Deceleration Lanes. BR-1.2: System shall properly export the events with 64 lane road configurations to the CHARTWeb and CHART Intranet Map.	Exporter	UC-1.0	DD 5.2.1.2.1
ATMS-887	BR-2.1 The system shall allow a specific DMS to be configured to skip the Font Status check when putting that DMS online or maintenance mode. BR-2.2The system shall perform the font status check, by default.	DMS	UC-2.0	DD 3.1.1.1.1 DD 3.1.1.2.1.4.1.1
ATMS-2200	BR-4.1: The system shall not allow the user to double click on activate permit link. BR-4.2: The system shall not allow the user to double click on activate permit button.	LCP	UC-4.0	DD 5.2.1.2.3
ATMS-2281	BR-5.1: The system shall set the status of NTCIP DMS model to the HW_FAIL, if DMS have any Hardware Failure Details listed. BR-5.2: The system shall set the status of NTCIP DMS model to OK if Hardware Failure Details is set to No Error.	DMS	UC-5.0	DD 4.8 DD 5.2.1.2.4
ATMS-2377	BR-7.1. SR1.4.2.3.5 The home page shall contain an area used to view open events for the user's Center. BR-7.2. SR1.4.2.3.5.1 The system shall display the number of events of each type that are open and controlled by the logged in user's Center. BR-7.3. SR1.4.2.3.5.1.1 The event name shall be a link that when clicked causes the details page for the event to be shown in the user's working window. BR-7.4. SR1.4.2.3.5.2 The event name shall be shown for each event. BR-7.5. SR1.4.2.3.5.2.1 The event name shall be a link that when clicked causes the details page for the event to be shown in the user's working window.	Traffic Event	UC-7.0	DD 4.1.1

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-7.6. SR1.4.2.3.5.3 The event location shall be shown for each event. BR-7.7. SR1.4.2.3.5.4 The County and/or state shall be shown for each event if the county and/or state has been specified for the event. BR-7.8. SR1.4.2.3.5.5 The system shall show information specific to events of type incident. BR-7.9. SR1.4.2.3.5.5.1 The system shall show the lane closures for each incident if lane closure information has been specified for the incident. BR-7.10. SR1.4.2.3.5.5.2 The system shall show the vehicles involved for each incident if specified for the incident. BR-7.11. SR1.4.2.3.5.6 The system shall show the recurring indicator for each event of type congestion. BR-7.12. SR1.4.2.3.5.7 The system shall show the color/make and/or tag information for each event of type disabled vehicle if the color/makes and/or tag information has been specified for the disabled vehicle event. BR-7.13. SR1.4.2.3.5.8 The system shall show the lane closures for each event of type planned closure if the lane closure information has been specified for the planned closure. BR-7.14. SR1.4.2.3.5.9 The system shall show the lane closures for each event of type special event if the lane closure information has been specified for the special event. BR-7.15. SR1.4.2.3.5.10 The system shall show the road conditions for each event of type weather service event if the road condition has been specified for the weather service event. BR-7.16. SR1.4.2.3.5.11 The Home Page shall indicate if an event is a Linked Event. BR-7.17. SR1.4.2.3.5.11.1 The Home Page shall indicate which columns contain values obtained from an External Event and therefore were not entered by an ATMS user. BR-7.18. SR1.4.2.3.5.11.2 The Home Page Event List page shall indicate if any External Event Change Indicator is set for a Linked Event. BR-7.19. SR1.4.2.3.6 The home page shall contain an area used to view open events for the user's areas of responsibility. BR-7.20. SR1.4.2.4 The system shall display (by default) all the open events for the user's areas of responsibility, by event type on the Operations Center home page.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-7.21. SR4.1.17 Pending traffic events shall not appear on user's Home page traffic event list. BR-7.22. SR4.1.22.1.3 External traffic events which have been flagged by any CHART user as interesting shall appear on the Home page traffic event list, in a separate External event tab, for suitably privileged users. BR-7.23. SR4.1.22.1.3.1 External traffic events appearing in the external event tab shall be marked in the list as to their traffic event type. (All traffic event types appear in the same external event tab.) BR-7.24. The system shall display a description of the lane closures when the mouse cursor hovers over the icon of a traffic event with lane closures in the home page event list.			
ATMS-2378	BR-8.1. The system shall allow a suitably privileged user to flag an external event as "not interesting" BR-8.2. The system shall update the external events tab number when a flag is set to "not interesting".	Traffic Event	UC-8.0	DD 4.1.2
ATMS-2379	BR-42.1: The system shall allow the events list to be sorted by each column present in the sub-tabs of the events section of Home Page.	Traffic Event	UC-42.0	DD 4.1.3
ATMS-2380	BR-9.1. SR1.4.2.3.7 The home page shall contain an area used to view event resources supporting the in-service/out-of-service flag that are associated with the user's center. BR-9.2. SR1.4.2.3.7.1 The system shall filter the event resources view to allow the user to view "Field Units" or to view "Facilities". BR-9.3. SR1.4.2.3.7.1.1 The system shall consider an event resource a "Field Unit" for the purpose of display on the home page if the event resource supports in service / out of service status and the event resource supports unit names, and the event resource supports AVL. BR-9.4. SR1.4.2.3.7.1.2 The system shall consider an event resource a "Facility" for the purpose of display on the home page if the event resource supports in service / out of service status and the event resource supports unit names, and the event resource does not support AVL. BR-9.5. SR1.4.2.3.7.4 The system shall display the following information for each field unit shown in the home page event resources area, as applicable: An indicator of whether or not the event resource is in service or out of service, the event resource	Event Resource	UC-9.0	DD 4.2.1

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	type, the event resource name, the list of any patrol area AOR(s) assigned to the event resource, the contact assigned to the event resource (if set), the event resource's current location, if available (as detected via GPS), the AVL status, and a list of traffic events to which the event resource is assigned as BR-9.6. SR1.4.2.3.7.4.1 The system shall indicate if the AVL resource is on scene at the location of an assigned traffic event. (A resource is considered "on scene" for this purpose if it's arrived/responded status is set to true, but its departed status is not set to true.) BR-9.7. SR1.4.2.3.7.5 The system shall display the following information for each "Facility" shown in the home page event resources area, as applicable: An indicator of whether or not the event resource is in service or out of service, the event resource type, the event resource name, and a list of traffic events to which the event resource is assigned as an event participant. BR-9.8. SR1.4.2.3.7.7 The system shall allow the user to navigate to the details page for any of the events to which an event resource is assigned, as shown in the event resources section of the home page. BR-9.9. SR1.4.2.3.7.8 The system shall allow the user to navigate to the home page map zoomed to an event resource that is shown in the event resources section of the home page if the event resource supports AVL and has active AVL data. BR-9.10. SR1.4.2.3.7.11 The system shall allow the user to search for a field unit by unit name within the list of "Field Units" shown in the event resources section of the home page. BR-9.11. SR1.4.2.3.7.12 The system shall allow the user to search for a facility by name within the list of "Facilities" shown in the event resources section of the home page.			
ATMS-2381	BR-10.1. SR1.4.2.3.7.6 The system shall allow the user to toggle the in service / out of service status for each event resource shown in the home page event resources area. BR-10.2. SR1.4.2.3.7.13 The system shall allow a user to assign Patrol Area AOR(s) and an Assigned Contact to a field unit when that resource is placed in service. BR-10.3. SR1.4.2.3.7.13.1 when a field unit is placed in service, the system shall allow a user to select Patrol Area AOR(s) from a list of AORs that match on the operations center of the field unit and are designated as Patrol Area AOR(s).	Event Resource	UC-10.0	DD 4.2.2 DD 4.2.3

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-10.4. SR1.4.2.3.7.13.1.1 The system shall allow a user with the Manage Traffic Events right to select zero or more Patrol Area AOR(s) to assign to a field unit. BR-10.5. SR1.4.2.3.7.13.2 when a field unit is placed in service, the system shall allow a user to select from a list of contacts, derived from the call list contacts for the resource and any contacts designated as Resource Assignable Contacts. BR-10.6. SR1.4.2.3.7.13.2.1 The system shall allow a user to search the selectable Resource Assignable Contact list by First Name, Last Name, or Call Sign. BR-10.7. SR1.4.2.3.7.13.2.2 The system shall allow a user with the Manage Traffic Events right to assign only a single contact to a field unit. BR-10.8. SR1.4.2.3.7.14 The system shall allow a user with rights to modify or remove any or all Patrol Area AOR(s) associated with a field unit while that resource remains in service. BR-10.9. SR1.4.2.3.7.15 The system shall allow a user with rights to modify or remove an assigned contact from a field unit while that resource remains in service. BR-10.10. SR1.4.2.3.7.16 The system shall automatically remove all associated Patrol Area AOR(s) and any assigned contact from a field unit when that resource is placed out of service.			
ATMS-2382	BR-43.1: SR1.4.2.3.7.13 The system shall allow a user to assign Patrol Area AOR(s) and an Assigned Contact to a field unit when that resource is placed in service. BR-43.2: SR1.4.2.3.7.13.1 when a field unit is placed in service, the system shall allow a user to select Patrol Area AOR(s) from a list of AORs that match on the operations center of the field unit and are designated as Patrol Area AOR(s). BR-43.3: SR1.4.2.3.7.13.1.1 The system shall allow a user with the Manage Traffic Events right to select zero or more Patrol Area AOR(s) to assign to a field unit. BR-43.4: SR1.4.2.3.7.13.2 when a field unit is placed in service, the system shall allow a user to select from a list of contacts, derived from the call list contacts for the resource and any contacts designated as Resource Assignable Contacts. BR-43.5: SR1.4.2.3.7.13.2.2 The system shall allow a user with the Manage Traffic Events right to assign only a single contact to a field unit.	Event Resource	UC-43.0	DD 4.2.3
ATMS-2383	BR-44.1: SR1.4.2.3.7.9 The system shall allow the list of "Field Units" shown in the event resources section of the home page to be sorted by the in service / out of service status, event resource type, unit name, location, or AVL status. BR-44.2: SR1.4.2.3.7.10 The system shall allow the list of "Facilities" shown in the	Event Resource	UC-44.0	DD 4.2.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	event resources section of the home page to be sorted by the in service / out of service status, event resource type, or unit name.			
ATMS-2384	BR-11.1. SR1.4.2.3.4 The home page shall contain an area used to view/manage alerts that exist in the system for which the user has the appropriate functional rights to view/manage. BR-11.2. SR1.4.2.12.4 The system shall display an indication to the user on the Home Page when alerts matching the currently selected filter in the Alerts View are in the new state. BR-11.3. SR1.4.2.12.4.1 The system shall allow the user to display a summary of the most recently created alerts matching the currently selected filter in the Alerts View that is in the New state while viewing any view on the home page. BR-11.4. SR1.4.2.12.4.1.1 The alert summary shall include the alert type, description, and creation time for each alert. BR-11.5. SR1.4.2.12.4.2 The system shall display the number of alerts matching the currently selected filter in the Alerts View that is in the New state. BR-11.6. SR3.3.7 The system shall display alerts to a user with the appropriate functional rights when that user logs in. BR-11.7. SR3.4.1 a suitably privileged operator shall be able to view alerts. BR-11.8. SR3.4.1.1 The system shall display alerts at all times on the CHART home page. BR-11.9. SR3.4.1.1.1 The system shall organize the displayed alerts based on their current state. BR-11.10. SR3.4.1.1.2 The system shall show the number of alerts displayed for each alert state. BR-11.11. SR3.4.1.1.3 The system shall provide a visual cue to the user when there are alerts in the "New" state. BR-11.12. SR3.4.1.1.5 The system shall allow the displayed alerts to be filtered to show only alerts for which the logged in user is responsible. This will include all new alerts for the user's center, all alerts the user has placed into the "Accepted" state, and all alerts the user has placed into the "Delayed" state. BR-11.13. SR3.4.1.1.6 The system shall allow the displayed alerts to be filtered to show only alerts for which the logged in user's center is responsible. This will include all new alerts for the user's center, all alerts the center's users have placed	Alerts	UC-11.0	DD 4.3.1

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	into the "Accepted" state, and all alerts the center's users have placed into the "Delayed" state. BR-11.14. SR3.4.1.1.7 The system shall allow the displayed alerts to be filtered to show all alerts in the system if the user has the appropriate functional rights. BR-11.15. SR3.4.1.1.8 The system shall allow the displayed alerts to be filtered by the alert state. BR-11.16. SR3.4.1.1.9 The system shall show the type of each displayed alert. BR-11.17. SR3.4.1.1.10 The system shall show the description of each displayed alert. BR-11.18. SR3.4.1.1.11 The system shall show the date/time the alert was created if the alert is in the New or Accepted state. BR-11.19. SR3.4.1.1.12 The system shall show the date/time an alert in the Delayed state will revert to the new state. BR-11.20. SR3.4.1.1.13 The system shall provide a method for actions to be performed on each alert that is displayed, with the specific actions being dependent on the state of the alert and the functional rights of the user. BR-11.21. SR3.4.1.1.14 The system shall allow the user to click on an alert to cause the Alert Details Page for the alert to be shown in the user's working window. BR-11.22. SR3.4.1.3 The system shall allow a suitably privileged user to view closed alerts that remain on the online system (i.e., not yet removed from the online system to be archived). BR-11.23. SR3.4.1.3.1 The list of closed alerts shall show at a minimum the alert type, description, created time, closed time, and a link to access the Alert Details Page for the alert. BR-11.24. The system shall display Create Generic Alert tab on Home Page to the user with Create Manual Alert right. BR-11.25. The system shall display Device Failure Alert data to the user with View Device Failure Alert right. BR-11.26. The system shall display Duplicate Event Alert data to the user with View Duplicate Event Alert right. BR-11.27. The system shall display Open Event Alert data to the user with View Event Still Open Alert right. BR-11.28. The system shall display Schedule Action Alert data to the user with View			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	Execute Schedule Action Alert right. BR-11.29. The system shall display External connection Alert data to the user with View External Connection Alert right. BR-11.30. The system shall display External Event Alert data to the user with View External Event Alert right. BR-11.31. The system shall display Generic Alert data to the user with View Generic Alert right. BR-11.32. The system shall display Schedule Event Alert data to the user with View Schedule Event Action Alert right. BR-11.33. The system shall display service alert data to the user with View Service Alert right. BR-11.34. The system shall display Toll Rate Alert data to the user with View Toll Rate Alert right. BR-11.35. The system shall display Travel Time Alert data to the user with View Travel Time Alert right. BR-11.36. The system shall display unhandled Resource data to the user with View Unhandled Resources Alert right.			
ATMS-2385	BR-12.1. SR3.4.1.1.4 The system shall provide an audio cue to the user when there are alerts in the "New" state. BR-12.2. SR3.4.1.1.4.3 The system shall play the corresponding audio cue (by alert type) to the user upon receipt by the user session of the new alert. SR3.4.1.1.4.6 The system shall play the 'new alert still pending' audio cue periodically at the configured frequency while there exist alerts of any type that remain in the new state	Alerts	UC-12.0	DD 4.3.4
ATMS-2386	BR-13.1. SR3.4.2 A suitably privileged user shall be able to manage alerts through the following states: New, Accepted, Delayed, and Closed. BR-13.2. SR3.4.2.1 A suitably privileged user shall be able to manage alerts in the new state. BR-13.3. SR3.4.2.1.3 A suitably privileged user shall be able to perform the following actions on an alert in the New state: Escalate, Accept, Delay, Close, and Comment. BR-13.4. SR3.4.2.1.3.1 Performing an Escalate action on an alert in the New state shall leave the alert in the New state and force an immediate escalation cycle. (See	Alerts	UC-13.0	DD 4.3.2

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	1.1.1.6.1.1.3, which covers configuration of escalation path.) BR-13.5. SR3.4.2.1.3.2 Performing an Accept action on an alert in the New state shall move the alert to the Accepted state. BR-13.6. SR3.4.2.1.3.3 Performing a Delay action on an alert in the New state shall move the alert to the Delayed state. BR-13.7. SR3.4.2.1.3.4 Performing a Close action on an alert in the New state shall move the alert to the Closed state. BR-13.8. SR3.4.2.1.3.5 Performing a Comment action on an alert in the New state shall leave the alert in the New state and add the comment to the alert history. BR-13.9. SR3.4.2.2 A suitably privileged user shall be able to manage alerts in the Accepted state. BR-13.10. SR3.4.2.2.4 A suitably privileged user shall be able to perform the following actions on an alert in the Accepted state: Unaccept, Delay, Close, Edit, and Comment. BR-13.11. SR3.4.2.2.4.1 Performing an Unaccept action on an alert in the Accepted state shall move the alert to the New state. BR-13.12. SR3.4.2.2.4.2 Performing a Delay action on an alert in the Accepted state shall move the alert to the Delayed state. BR-13.13. SR3.4.2.2.4.3 Performing a Close action on an alert in the Accepted state shall move the alert to the Closed state. BR-13.14. SR3.4.2.2.4.5 Performing a Comment action on an alert in the Accepted state shall leave the alert in the Accepted state and add the comment to the alert history. BR-13.15. SR3.4.2.3 A suitably privileged user shall be able to manage alerts in the Delayed state. BR-13.16. SR3.4.2.3.4 A suitably privileged user shall be able to perform the following actions on an alert in the Delayed state: Accept, Undelay, Close, Edit, and Comment. BR-13.17. SR3.4.2.3.4.1 Performing an Accept action on an alert in the Delayed state shall move the alert to the Accepted state. BR-13.18. SR3.4.2.3.4.2 Performing an Undelay action on an alert in the Delayed state shall move the alert to the New state. BR-13.19. SR3.4.2.3.4.3 Performing a Close action on an alert in the Delayed state			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	shall move the alert to the Closed state BR-13.20. SR3.4.2.3.4.5 Performing a Comment action on an alert in the Delayed state shall leave the alert in the Delayed state and add the comment to the alert history. BR-13.21. SR3.4.2.4 A suitably privileged user shall be able to manage alerts in the closed state. BR-13.22. SR3.4.2.4.2 A suitably privileged user shall be able to perform the following actions on an alert in the Closed state: Comment. BR-13.23. SR3.4.2.4.2.1 Performing a Comment action on an alert in the Closed state shall leave the alert in the Closed state and add the comment to the alert history BR-13.24. SR3.4.2.5 In the process of performing any alert action, the user shall optionally be able to add a comment to the alert history. BR-13.25. SR3.4.2.6 A suitably privileged user shall be able to resolve alerts in the New, Accepted, and Delayed states. BR-13.26. SR3.4.2.6.1 Clicking the Resolve link of a Generic Alert shall take the user to the Details Page for the alert. BR-13.27. SR3.4.2.6.2 Clicking the Resolve link of an Unhandled Resource Alert shall take the user to the Transfer Unhandled Resources page. BR-13.28. SR3.4.2.6.3 Clicking the Resolve link of a Device Failure Alert shall take the user to the Details Page for that device. BR-13.29. SR3.4.2.6.4 Clicking the Resolve link of a Duplicate Event Alert shall take the user to the page that shows pertinent data from the two events, where the user can choose to merge the events, delete one of them, or associate them. BR-13.30. SR3.4.2.6.5 Clicking the Resolve link of an Event Still Open Alert shall take the user to the event details page. BR-13.31. SR3.4.2.6.6 Clicking the Resolve link of an Execute Scheduled Actions Alert containing at least two actions shall take the user to an Execute Scheduled Actions page.			
ATMS-2387	BR-14.1. SR3.3.9 The system shall provide the capability for a user to manually create a Generic Alert. BR-14.2. SR3.3.9.1 A user shall be required to provide a free-form text description to identify a Generic Alert. BR-14.3. The system shall provide the user to select one or more operations center.	Alerts	UC-14.0	DD 4.3.3

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-14.4. The system shall list centers that have at least one user logged in, should appear in the Op-Center list. BR-14.5. The system shall provide the user with appropriate rights to select Show All for showing all the Op-Centers. BR-14.6. The system shall provide the user to clear the form.			
ATMS-2388	BR-45.1: The system shall allow the list of "Alerts" shown in the alerts section of the home page to be sorted by type, description and times in new tab. BR-45.2: The system shall allow the list of "Alerts" shown in the alerts section of the home page to be sorted by type, text and times in accepted, delayed and closed tabs.	Alerts	UC-45.0	DD 4.3.1
ATMS-2389	BR-15.1. SR4.2.1.6.10 The system shall detect when the location entries made by the user match the location of an existing open event in the system and provide an indication to the user that the event may be a duplicate. BR-15.2. SR4.2.1.6.10.1 system shall not consider direction when determining if the location of an existing open event matches the location of the event being entered. BR-15.3. SR4.2.1.6.10.2 The system shall show the event name, event creation time, and responsible center for all open events shown as possible duplicates. BR-15.4. SR4.2.1.6.10.3 The system shall filter the list of possible duplicates to only show events that have been created within X minutes, where X is configurable by the system administrator. BR-15.5. SR4.2.1.6.10.4 The list of possible duplicate open events shall be ordered by event creation time, with the most recently created event first. BR-15.6. SR4.2.1.6.10.5 The system shall not flag Pending traffic events as possible duplicates of the event being created. BR-15.7. SR4.2.1.6.10.6 The system shall not flag External traffic events as possible duplicates of the event being created. BR-15.8. The system shall filter the list of possible duplicates to only show events that have matching State. BR-15.9. The system shall filter the list of possible duplicates to only show events that have matching State, and County. BR-15.10. The system shall filter the list of possible duplicates to only show events that have matching State, County, Route Type, and Route Name. BR-15.11. The system shall filter the list of possible duplicates to only show events that have matching State, County, Route Type and Route Number.	Traffic Events	UC-15.0	DD 4.5

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-15.12. The system shall filter the list of possible duplicates to only show events that have matching State and Region. BR-15.13. The system shall filter the list of possible duplicates to only show events that have matching State, Region, and if Route is not specified. BR-15.14. The system shall display Event Description when the user hovers the mouse on the Event Name listed in Potential Duplicate Event List. BR-15.15. The system shall display Op-Center name when the user hovers the mouse on the Op-Center listed in Potential Duplicate Event List. BR-15.16. The system shall display Event details when the user clicks on Event listed in Potential Duplicate Event List. BR-15.17. The system shall display Op-Center Report when the user clicks on Op-Center listed in Potential Duplicate Event List.			
ATMS-2390	BR-16.1. SR4.2.1 The system shall allow a suitably privileged user to create a new event. BR-16.2. SR4.2.1.3 The system shall store the associated Center with each event entry. BR-16.3. SR4.2.1.6 The system shall allow the user to create a new event in the open state from their home page. BR-16.4. SR4.2.1.6.1 The system shall allow the user to specify the location of the new event. BR-16.5. SR4.2.1.6.2 The system shall allow the user to specify the source for the new traffic event. BR-16.6. SR4.2.1.6.2.1 The system shall allow the user to specify the source type for the new traffic event. BR-16.7. SR4.2.1.6.2.2 The system shall allow the user to specify the source name for the new traffic event when the source type specified is not "Field Unit". BR-16.8. SR4.2.1.6.2.3 The system shall allow the user to specify the unit name (of an event resource with a unit name) for the new traffic event when the source type specified is "Field Unit". BR-16.9. SR4.2.1.6.4 The system shall allow the user to select the incident type for the new event. BR-16.10. SR4.2.1.6.4.1 The system shall disregard the user's incident type selection if the user chooses to create an event type other than the incident.	Traffic Events	UC-16.0	DD 4.5

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-16.11. SR4.2.1.6.5 The system shall allow the user to specify the vehicle Color/Make for the new event. BR-16.12. SR4.2.1.6.5.1 The system shall ignore the user's entry for the vehicle color/make if the user chooses to create an event type other than a disabled vehicle. BR-16.13. SR4.2.1.6.6 The system shall allow the user to specify the vehicle Tag Information for the new event. BR-16.14. SR4.2.1.6.6.1 The system shall ignore the user's entry for the vehicle tag information if the user chooses to create an event type other than a disabled vehicle. BR-16.15. SR4.2.1.6.7 The system shall allow the user to specify the type of event to be created. BR-16.16. SR4.2.1.6.7.1 The system shall allow the user to specify that the event is an Action Event. BR-16.17. SR4.2.1.6.7.2 The system shall allow the user to specify that an event is a Congestion Event. BR-16.18. SR4.2.1.6.7.3 The system shall allow the user to specify that an event is a Disabled Vehicle Event. BR-16.19. SR4.2.1.6.7.4 The system shall allow the user to specify that an event is an Incident Event. BR-16.20. SR4.2.1.6.7.5 The system shall allow the user to specify that an event is a Planned Roadway Closure Event. BR-16.21. SR4.2.1.6.7.6 The system shall allow the user to specify that an event is a Safety Message Event. BR-16.22. SR4.2.1.6.7.7 The system shall allow the user to specify that an event is a Special Event. BR-16.23. SR4.2.1.6.7.8 The system shall allow the user to specify that an event is a Weather Service Event.SR4.2.1.6.9 The system shall display the details page for the newly created event in the user's working window after the event is created. BR-16.24. SR4.2.1.6.12 Create Event At Map Location BR-16.25. SR4.2.1.6.12.1 The system shall allow the user to initiate the opening of a new traffic event by clicking on the map to specify the location of the traffic event. BR-16.26. SR4.2.1.6.12.4 The system shall allow the user to specify location information for the new traffic event according to the Specify Object Location Using Map requirements.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-16.27. SR4.2.1.6.12.5 The system shall allow the user to initiate the opening of a new traffic event by choosing a Traffic Signal on the map to specify the location of the traffic event. BR-16.28. SR4.2.1.6.12.5.1 The system shall associate the Traffic Signal used to locate the event with the Action Event if the user chooses to create an Action Event at this location. (Note: If the user manually changes any of the location fields on the create event page after using a Traffic Signal to locate the event, it will not be associated with the created Action Event (as the event will no longer be created using the traffic signal as the source of the event location)). BR-16.29. SR4.2.1.6.13 The system shall allow the user to clear the form fields (and map marker, if displayed) with a single action on the Create Event form. BR-16.30. SR4.2.1.9 Create Traffic Event Via Comm Log. BR-16.31. SR4.2.1.9.1 The system shall allow a user to select one or more communications log entries to be added to the history log of the traffic event created from the communications log. BR-16.32. SR4.2.1.9.2 The system shall allow the user to invoke a form for creating a new Action Event from the communications log window, pre-populated with the log entries selected from the communications log. BR-16.33. SR4.2.1.9.3 The system shall allow the user to invoke a form for creating a new Incident from the communications log window, pre-populated with the log entries selected from the communications log. BR-16.34. SR4.2.1.9.4 The system shall allow the user to invoke a form for creating a new Disabled Vehicle Event from the communications log window, pre-populated with the log entries selected from the communications log. BR-16.35. SR4.2.1.9.5 The system shall allow the user to invoke a form for creating a new Planned Roadway Closure Event from the communications log window, pre-populated with the log entries selected from the communications log. BR-16.36. SR4.2.1.9.6 The system shall allow the user to invoke a form for creating a new Congestion Event from the communications log window, pre-populated with the log entries selected from the communications log. BR-16.37. SR4.2.1.9.7 The system shall allow the user to invoke a form for creating a new Weather Service Event from the communications log window, pre-populated with the log entries selected from the communications log.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-16.38. SR4.2.1.9.8 The system shall allow the user to invoke a form for creating a new Special Event from the communications log window, pre-populated with the log entries selected from the communications log. BR-16.39. SR4.2.1.9.9 The system shall allow the creation of a Safety Message Event from the communications log window, pre-populated with the log entries selected from the comm log. BR-16.40. SR4.2.1.10 The system shall add a response participant to the newly created traffic event for the Field Unit specified as the source for the traffic event if any. BR-16.41. SR4.2.1.10.1 The system shall automatically set the participant's responded flag to true when a participant is added to the traffic event at creation for a field unit specified as the source for the traffic event. BR-16.42. SR4.2.1.7 The system shall allow a suitably privileged user to create a new event in the pending state. BR-16.43. The system shall allow the user to confirm the newly created event.			
ATMS-2391	BR-18.1 The system shall use HTML5 / Javascript for the Edit Location form and any data that it manages.	Traffic Events & Devices	UC-18.0	DD 4.4
ATMS-2392	BR-50.1. The system shall populate the Edit Location form for a new object location using default values. BR-50.2. The system shall populate the Edit Location form with values from an existing location, if editing an existing location. BR-50.3. The system shall populate the Alias list, if Aliases GIS data are available. BR-50.4. The system shall default the Show All Aliases setting to false. BR-50.5. The system shall populate the State list, including a blank entry representing no state. BR-50.6. SR1.1.8.1.1.1.1 The system shall default the state selection to MD. BR-50.7. The system shall populate the County list if the initial state is MD. BR-50.8. The system shall populate the Region list if the initial state is MD. BR-50.9. The system shall populate the form using default data for the states, MD counties, and MD regions if the data is not available from a GIS service. BR-50.10. The system shall default the Route Type selection to Interstate BR-50.11. The system shall not allow the user to select a Route Type of Other or	Traffic Events & Devices	UC-50.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	Unknown except for: On/Off Devices, and traffic events that already have such route types (e.g., that are linked to External Events). BR-50.12. The system shall populate the Route list if the existing location includes State: MD and County, if routes are available from a GIS service. BR-50.13. The system shall allow the user to enter a freeform route description for a MD route if the routes are not available from a GIS service. BR-50.14. The system shall default the Show Route Name setting to false, unless overridden for Route Type: Interstate in the User Preferences. BR-50.15. The system shall default the Direction selection to None, if a direction of None is allowed. BR-50.16. The system shall not allow the user to select a direction of None for: SHAZAMs. BR-50.17. The system shall not allow the user to select combination directions such as North/South, East/West, and Inner/Outer Loop for: DMSs and SHAZAMs. BR-50.18. The system shall default the Proximity selection to "AT". BR-50.19. The system shall populate the Intersecting route list if the existing location contains State: MD, County, Route, and Intersecting Feature Type: Road, if intersecting routes are available from a GIS service. BR-50.20. The system shall default the Intersecting Road Show Name setting to true, unless overridden in the User Preferences. BR-50.21. The system shall populate the Exit list if the existing location contains State: MD, County, Route, and Intersecting Feature Type: Exit, if exits are available from a GIS service. BR-50.22. The system shall populate the Milepost range information if the existing location contains State: MD, County, Route, and Intersecting Feature Type: Milepost, if mileposts are available from a GIS service. BR-50.23. The system shall hide the Latitude / Longitude entry fields for the Edit Location form for traffic event locations. BR-50.24. The system shall default the Location Description to "MD" BR-50.25. The system shall default the Override Location Description setting to false.			
ATMS-2393	BR-19.1 SR1.1.8.1.1.11 The system shall allow the user to pre-populate the location fields by selecting a named location known as a "location alias".	Traffic Events &	UC-19.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-19.2 The system shall update the map to show the location of the alias if the alias contains geographic coordinates. BR-19.3 SR1.1.8.1.1.11.1 The list of location aliases shall be filtered to include ~~only~~ aliases located in the areas of responsibility that are associated with the user's operations center. BR-19.4 The filtered alias list shall include aliases from all patrol areas in the system. BR-19.5 The filtered alias list shall include an alias selected previously (e.g. if editing a location with a specified alias, or if an alias was selected from the unfiltered list before the Show All Aliases checkbox was unchecked). BR-19.6 SR1.1.8.1.1.11.1.1 The list of location aliases shall include all location aliases if no areas of responsibility are associated with the user's operations center. BR-19.7 SR1.1.8.1.1.11.2 The system shall allow the user to view the full un-filtered list of location aliases in the system. BR-19.8 The system shall update the list of aliases to include an alias added since the form was first displayed. BR-19.9 The system shall reset any field not specified as part of the alias to its default value (see the Initialize Edit Location form requirements). BR-19.10The system shall populate the County list if the alias contains State: MD. BR-19.11The system shall populate the Region list if the alias contains State: MD. BR-19.12The system shall populate the form using default data for the states, MD counties, and MD regions if the data is not available from a GIS service. BR-19.13The system shall populate the Route list if the alias location contains State: MD and County, if routes are available from a GIS service. BR-19.14The system shall allow the user to enter a freeform route description for a MD route if the routes are not available from a GIS service. BR-19.15The system shall populate the Intersecting route list if the alias contains State: MD, County, Route, and Intersecting Feature Type: Road, if intersecting routes are available from a GIS service. BR-19.16The system shall populate the Exit list if the alias contains State: MD, County, Route, and Intersecting Feature Type: Exit, if exits are available from a GIS service. BR-19.17The system shall populate the Milepost range information if the alias contains State: MD, County, Route, and Intersecting Feature Type: Milepost, if mileposts are	Devices		

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	available from a GIS service.			
ATMS-2394	BR-20.1 SR1.1.8.1.1.1 The system shall allow the user to select the U.S. state where an object is located. BR-20.2 The system shall allow the user to select no U.S. state (to allow the user to specify a multi-state region). BR-20.3 The system shall reset the non-State fields to their default values when the state is changed, including: Alias, County, Region, all route fields (Route Type, Route, Direction, Proximity, Intersecting Feature Type), and Latitude/Longitude. BR-20.4 The system shall populate the County list if the state is changed to MD. BR-20.5 The system shall populate the Region list if the state is changed to MD. BR-20.6 The system shall use default data for MD counties and regions if the data is not available from a GIS service. BR-20.7 The system shall update the location description when the state is changed. BR-20.8 SR1.1.8.1.2.3.1 The system shall pan and/or zoom the map when the State selection is changed on the Object Location form to show the selected state, if the extents of the state are known.	Traffic Events & Devices	UC-20.0	DD 4.4
ATMS-2395	BR-21.1 SR1.1.8.1.1.2 The system shall allow the user to specify the county in which the object is located. BR-21.2 SR1.1.8.1.1.2.1 The system shall require the user to select a valid county from a list when specifying a county using the location form, if the selected state is MD. BR-21.3 SR1.1.8.1.1.2.1.1 The system shall display the user's most recently used counties (counties used when creating events) at the top of the counties list, if the state is MD. (Modified for R18 to add clause in parenthesis). BR-21.4 The system shall update the most recently used counties list on the Create Events page when an event is created. BR-21.5 SR1.1.8.1.1.2.1.2 The system shall display all counties in MD, if the selected state is MD. BR-21.6 SR1.1.8.1.1.2.2 The system shall allow the user to enter the county name as freeform text, if the selected state is not MD. BR-21.7 SR1.1.8.1.1.3 The system shall allow the user to specify the region in which the object is located.	Traffic Events & Devices	UC-21.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-21.8 SR1.1.8.1.1.3.1 The system shall require the user to select a predefined region from a list when specifying a region using the location form, if the selected state is MD. BR-21.9 SR1.1.8.1.1.3.1.1 The system shall include the following regions in the list, if the selected state is MD: Statewide, Baltimore Region, Washington Region, Western Maryland, Eastern Shore, Northern Maryland, and Southern Maryland. BR-21.10SR1.1.8.1.1.3.2 The system shall allow the user to enter the region name as freeform text, if the selected state is not MD. BR-21.11SR1.1.8.1.1.4 The system shall not allow both a region and a county to be specified at the same time. BR-21.12The system shall clear the Alias, Region, Intersecting Feature (Road, Exit, or Milepost), and Latitude / Longitude when the County is changed. BR-21.13The system shall clear the Route when the County is changed, unless it is a MD County and the route exists in the newly-selected county. BR-21.14The system shall populate the intersecting feature list for a route within the newly selected MD county, if the route selection is preserved. BR-21.15The system shall populate the Route list when a MD County is selected, if route data is available from a GIS service. BR-21.16SR1.1.8.1.2.3.2 The system shall pan and/or zoom the map when the County selection is changed on the Object Location form to show the selected county, if the extents of the county are known. BR-21.17The system shall clear the Alias, County, Route, Intersecting Feature (Road, Exit, or Milepost), and Latitude / Longitude when the Region is changed. BR-21.18The system shall update the location description when the County is changed. BR-21.19The system shall update the location description when the Region is changed.			
ATMS-2396	BR-22.1 SR1.1.8.1.1.5 The system shall allow the user to specify the type of route on which an object is located, such as interstate or state route. BR-22.2 The system shall display the State Route type as the postal code abbreviation of the state. BR-22.3 The system shall set the Show Name flag for the selected route type, if specified in the User Preferences when the Route Type is changed. BR-22.4 The system shall populate the Route list with the routes based on the County and Route Type, if a MD county is selected and routes are available from a GIS	Traffic Events & Devices	UC-22.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	service. BR-22.5 The system shall clear the following fields when the Route Type is changed: Alias, Route, Intersecting Feature (Road, Exit, Milepost), Latitude / Longitude. BR-22.6 The system shall update the location description when the Route Type is changed, if a route was previously specified. BR-22.7 The system shall update the map to remove any marker from the previously specified location, if the coordinates were from GIS data and were not for a user-initiated location from the map.			
ATMS-2397	BR-23.1. SR1.1.8.1.1.6 The system shall allow the user to specify the route on which the object is located. BR-23.2. SR1.1.8.1.1.6.1 The system shall provide a list of known routes from a GIS database for user selection if the user has selected a state, county, and route type, if known routes exist for the selections made. BR-23.3. SR1.1.8.1.1.6.1.1 The system shall require the user to select a route from the list of known routes, or select no route, if the selected state is MD and the list of known routes is available for the current selections. BR-23.4. SR1.1.8.1.1.6.1.2 The system shall allow the user to enter the route description as free form text, if the selected state is MD but the list of known routes could not be obtained from the GIS database. BR-23.5. The system shall allow the user to enter the route description as freeform text if editing a location that contains a route that was previously specified as freeform text. BR-23.6. SR1.1.8.1.1.6.2 The system shall allow the user to specify the route description using free form text if the selected state is not MD. BR-23.7. The system shall re-select the same main route if the county selection is changed and the same route exists in the newly-selected county. BR-23.8. The system shall clear the Alias, Intersecting Feature (Road / Exit / Milepost), and Latitude/Longitude if the Route is changed. BR-23.9. The system shall clear the location marker on the map if the Route is changed. BR-23.10. The system shall update the Location Description if the Route is changed. BR-23.11. The system shall represent all routes having the same name as a single item in the Route list when displaying routes by name. (For example, in Barnesville	Traffic Events & Devices	UC-23.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	Rd in Montgomery County includes portions of both MD 109 and MD 117, so the name "Barnesville Rd" would be shown as a single item in the list but it represents multiple routes). BR-23.12. The system shall by default represent all routes having the same route number (but different suffixes) as a single item in the Route list when displaying routes by number. (For example, MD 648 in Anne Arundel County would represent ALL of these actual routes: MD 648 A, MD 648 AA, MD 648 AB, MD 648 D, MD 648 E, MD 648 F, MD 648 G, MD 648 H, and MD 648 I). (This is done so that operators do not need to know which specific suffix to choose, in cases where the GIS data contains non-intuitive route suffixes). BR-23.13. The system shall display a route number with suffix if the route number / suffix combination is specified as one of the Route Numbers With Important Suffixes in the System Profile, when displaying routes by number. (This allows users to distinguish between routes that actually different routes, such as US 40 AL which is a different road than US 40). BR-23.14. The system shall populate the Intersecting Features lists (Road list, Exit list, and Milepost ranges) for the set of routes represented by the selected item when an item is selected in the Route list. (As noted in requirements above, it is possible for a single item in the list to represent more than one route, whether displaying routes by name or by number).			
ATMS-2398	BR-24.1. SR1.1.8.1.1.6.1.3 The system shall allow the user to specify whether to display the route number or the local road name when displaying the known route that came from the GIS database. BR-24.2. The system shall repopulate the Route list according to the new value of the Show Name flag. (See Route requirements BR-23.10 and BR-23.11) BR-24.3. The system shall select an item in the Route list with the number/name of a route matching the name/number of the item that was selected prior to changing Show Name to false/true, but only if the new selection can be made unambiguously. (There may be no way for the system to know which number/name the user intended to pick if there were multiple routes represented by the previously-selected item). BR-24.4. The system shall select the Route on which the Intersecting Road or Exit lies when the Show Name flag is changed, if an Intersecting Road or Exit is selected when the Show Name checkbox is changed for the main route. (The Intersecting	Traffic Events & Devices	UC-24.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	Road/Exit gives additional information to allow the selection of the correct route). BR-24.5. The system shall repopulate the Intersecting Features (Road list, Exit list, and Milepost ranges) if the newly-selected Route list item represents a different set of routes than the previous selection represented. BR-24.6. The system shall update the location description when the Show Name flag is changed. BR-24.7. The system shall NOT clear the selected Alias when the Show Name flag is changed.			
ATMS-2399	BR-25.1. SR1.1.8.1.1.6.3 The system shall allow the user to select the direction(s) of the route describing the side(s) of the roadway on which the object is located. (Some objects, such as traffic events, may be located on both sides of the roadway). BR-25.2. SR1.1.8.1.1.6.3.1 The available directions shall include: None, North, South, East, West, Inner Loop, Outer Loop, North/South, East/West and Inner Loop/Outer Loop. (Modified from South/North for R16). BR-25.3. The system shall update the Location Description if the direction is changed while a Route is specified. BR-25.4. The system shall NOT clear a selected Alias if the Direction is changed. BR-25.5. SR1.1.8.1.1.7 The system shall allow the user to specify that the object's location is relative to a single feature on the route. BR-25.6. SR1.1.8.1.1.7.2 The system shall allow the user to specify the object's proximity to the specified feature on the route. BR-25.7. SR1.1.8.1.1.7.2.1 The proximity values for describing the object's position relative to a single feature on the route shall include: AT, PAST, PRIOR TO, WEST OF, NORTH OF, EAST OF, and SOUTH OF. BR-25.8. SR1.1.8.1.1.7.2.2 The system shall use a proximity value of 'AT' if the user does not specify a value. BR-25.9. The system shall allow the user to specify up to one intersecting feature if a proximity of AT, PAST, PRIOR TO, WEST OF, NORTH OF, EAST OF, or SOUTH OF is selected. BR-25.10. SR1.1.8.1.1.8 The system shall allow the user to specify that the object is located between two features on the route. BR-25.11. SR1.1.8.1.1.8.4 The system shall allow the user to specify the object's proximity to the specified features on the route.	Traffic Events & Devices	UC-25.0	

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-25.12. SR1.1.8.1.1.8.4.1 The proximity values for describing an object that is located between two features on the route shall include: 'FROM-TO' and 'BETWEEN'. BR-25.13. The system shall allow the user to specify up to two intersecting features if a proximity of FROM-TO or BETWEEN is selected. BR-25.14. The system shall update the Location Description if the Proximity is changed and the number of intersecting features that are specified is the same as the expected number of intersecting features for the given proximity. BR-25.15. The system shall clear an Alias selection if the expected number of intersecting features for the new Proximity is changed.			
ATMS-2400	BR-26.1. SR1.1.8.1.1.7.1 The system shall allow the user to specify a feature on the route relative to which the object is located, as described in the Specify Feature On Route requirements. (R18 note: This is a high-level requirement which is covered by other use cases; this use case only addresses selecting the Intersecting Feature Type). BR-26.2. The system shall allow the user to specify the type of each intersecting feature that is allowed according to the selected Proximity. BR-26.3. The system shall clear any previously selected intersecting feature (Road, Exit, Milepost) when the Intersecting Feature Type is changed. BR-26.4. The system shall clear the second intersecting feature (for a Proximity of FROM TO or BETWEEN) if the primary intersecting feature's type is changed. BR-26.5. The system shall clear the Latitude / Longitude if it is derived from the intersecting feature that was cleared. BR-26.6. The system shall clear the map marker for the location if the Latitude / Longitude is cleared. BR-26.7. The system shall clear the map marker(s) for any intersecting features that were cleared, for the Proximity of FROM TO or BETWEEN. BR-26.8. The system shall update the Location Description when the Intersecting Feature Type is changed, if an intersecting feature was cleared. BR-26.9. The system shall clear the Alias selection when the Intersecting Feature Type is changed.	Traffic Events & Devices	UC-26.0	DD 4.4
ATMS-2401	BR-27.1. SR1.1.8.1.1.9.3 The system shall allow the user to specify an intersection with another route as a feature on a route. BR-27.2. SR1.1.8.1.1.9.3.1 The system shall provide a list of known intersecting	Traffic Events & Devices	UC-27.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	routes from a GIS database for user selection if the user has selected a state, county, route type, and main route, if intersecting routes exist in the GIS database for the selections made. BR-27.3. SR1.1.8.1.1.9.3.1.1 The system shall allow the user to select an intersecting route, if the selected state is MD and the list of intersecting routes is available from the GIS database for the current selections. BR-27.4. SR1.1.8.1.1.9.3.2 The system shall allow the user to specify the intersecting route description using free form text if the text does not match the route number (or name, if displaying known routes by name) of a known intersecting route retrieved from the GIS database. BR-27.5. SR1.1.8.1.1.9.5 The system shall allow a user to specify a ramp as an intersecting feature along the route. BR-27.6. SR1.1.8.1.1.9.5.1 The system shall provide a list of known ramps from a GIS database for user selection if the user has selected a state, county, route type, and main route, if ramps exist in the GIS database for the selections made. BR-27.7. SR1.1.8.1.1.7.1.1 The system shall automatically populate the geographic location of the object if a single intersection with another route is specified and the geographic location of the intersection is available from the GIS database. BR-27.8. SR1.1.8.1.1.8.1 The system shall allow the user to specify a feature on the route marking the beginning of the interval containing the object, as described in the Specify Feature On Route requirements. BR-27.9. SR1.1.8.1.1.8.1.1 The system shall automatically populate the geographic location of the object using the beginning of the interval if an intersection with another route is specified and the geographic location of the intersection is available from the Spatial Web Service. BR-27.10. SR1.1.8.1.1.8.2 The system shall allow the user to specify a feature on the route marking the end of the interval containing the object, as described in the Specify Feature On Route requirements. BR-27.11. SR1.1.8.1.1.8.2.1 The system shall attempt to populate the geographic location of the object using the ending of the interval only if the geographic location is not available for the beginning of the interval. BR-27.12. SR1.1.8.1.1.8.2.1.1 The system shall automatically populate the geographic location of the object using the ending of the interval if an intersection			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	with another route is specified and the geographic location of the intersection is available from the GIS database. BR-27.13. SR1.1.8.1.1.8.3 The system shall prevent the user from specifying a beginning and ending feature of an interval that are the same feature. BR-27.14. SR1.1.8.1.2.3.4 The system shall pan and/or zoom the map when the Intersecting Feature selection is changed on the Object Location form to include an area around the intersecting feature, if the location of the intersecting feature is known. BR-27.15. SR1.1.8.1.2.3.4.1 The system shall pan and/or zoom the map when the second Intersecting Feature selection is changed on the Object Location form (for a proximity of BETWEEN or FROM-TO) to include an area including both intersecting features, if the location of the intersecting features are known. BR-27.16. The system shall clear the selected Alias if the intersecting route is changed.			
ATMS-2402	BR-28.1. SR1.1.8.1.1.9.3.1.2 The system shall allow the user to specify whether to display the route number or the local road name when displaying the known intersecting route that came from the GIS database. BR-28.2. The system shall repopulate the Intersecting Road list when the Show Name flag is changed. BR-28.3. The system shall reselect the Intersecting Road in the list after the Show Name flag has changed. BR-28.4. The system shall append the main route number (and any other text as necessary) to the list item to allow the user to distinguish between items if there are duplicate names or numbers in the Intersecting Road list. BR-28.5. The system shall not include the appended main route number in the Location Description. BR-28.6. The system shall use the coordinates of the intersection to help distinguish between duplicate intersecting roads, such as when an existing location is edited. BR-28.7. The system shall set the value of the Show Name checkbox for intersecting routes when the Edit Location form is initialized for a new location or reset, if a value is specified in the User Preferences (General -> Change Preferences -> Specify Location Form: Show Name Checkboxes -> Intersecting Routes) and the value is different than the current value.	Traffic Events & Devices	UC-28.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-28.8. The system shall update the Location Description when the Show Name flag is changed for the Intersecting Road, if a road is selected. BR-28.9. The system shall NOT clear the selected Alias if the Show Name flag is changed for an Intersecting Road.			
ATMS-2403	BR-29.1. SR1.1.8.1.1.9.4 The system shall allow the user to specify an exit number as a feature on the route. BR-29.2. SR1.1.8.1.1.9.4.1 The system shall provide a list of known exit numbers from a GIS database for user selection if the user has selected a state, county, route type, and main route, if exit numbers exist in the GIS database for the selections made. BR-29.3. SR1.1.8.1.1.9.4.2 The system shall allow the user to enter an exit number as free form text. BR-29.4. SR1.1.8.1.1.7.1.2 The system shall automatically populate the geographic location of the object if a single exit is specified and the geographic location of the exit is available from the GIS database. BR-29.5. SR1.1.8.1.1.8.1 The system shall allow the user to specify a feature on the route marking the beginning of the interval containing the object, as described in the Specify Feature On Route requirements. BR-29.6. SR1.1.8.1.1.8.1.2 The system shall automatically populate the geographic location of the object using the beginning of the interval if an exit is specified and the geographic location of the exit is available from the GIS database. BR-29.7. SR1.1.8.1.1.8.2 The system shall allow the user to specify a feature on the route marking the end of the interval containing the object, as described in the Specify Feature On Route requirements. BR-29.8. SR1.1.8.1.1.8.2.1 The system shall attempt to populate the geographic location of the object using the ending of the interval only if the geographic location is not available for the beginning of the interval. BR-29.9. SR1.1.8.1.1.8.2.1.2 The system shall automatically populate the geographic location of the object using the ending of the interval if an exit is specified and the geographic location of the exit is available from the GIS database. BR-29.10. SR1.1.8.1.1.8.3 The system shall prevent the user from specifying a beginning and ending feature of an interval that are the same feature. BR-29.11. SR1.1.8.1.2.3.4 The system shall pan and/or zoom the map when the	Traffic Events & Devices	UC-29.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	Intersecting Feature selection is changed on the Object Location form to include an area around the intersecting feature, if the location of the intersecting feature is known. BR-29.12. SR1.1.8.1.2.3.4.1 The system shall pan and/or zoom the map when the second Intersecting Feature selection is changed on the Object Location form (for a proximity of BETWEEN or FROM-TO) to include an area including both intersecting features, if the location of the intersecting features are known. BR-29.13. The system shall clear the Alias selection if the Intersecting Exit is changed.			
ATMS-2404	BR-30.1. SR1.1.8.1.1.9.1 The system shall allow a user to specify a state milepost number as a feature on a route. BR-30.2. SR1.1.8.1.1.9.1.1 The system shall allow the user to specify a state milepost value using a freeform numerical value. BR-30.3. SR1.1.8.1.1.9.1.2 The system shall display the range of known state milepost values for reference when the user specifies a state milepost, if the range of mileposts is known. BR-30.4. SR1.1.8.1.1.9.2 The system shall allow a user to specify a county milepost number as a feature on a route. BR-30.5. SR1.1.8.1.1.9.2.1 The system shall allow the user to specify a county milepost value using a freeform numerical value. BR-30.6. SR1.1.8.1.1.9.2.2 The system shall display the range of known county milepost values for reference when the user specifies a county milepost, if the range of mileposts is known. BR-30.7. SR1.1.8.1.1.7.1.3 The system shall automatically populate the geographic location of the object if a single milepost is specified and the geographic location of the milepost is available from the GIS database. BR-30.8. SR1.1.8.1.1.7.1.3.1 The system shall use interpolation to find the approximate coordinates for a milepost that is between two mileposts with known coordinates that are within some threshold distance of each other, if the milepost does not match a known milepost from the GIS database. (This location will likely be off the road to some extent, but the user can manually adjust the coordinates, as described in one of the requirements under Specify Object Location Using Map and Form). BR-30.9. The system shall calculate the geographic location only if the milepost is	Traffic Events & Devices	UC-30.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	valid for exactly ONE route. (The selected item in the Main Route list can represent multiple routes with the same name or number, and it is possible for a given milepost to be valid for more than one of those routes, in which case it is ambiguous to determine which route it is on, so the system cannot convert to coordinates). BR-30.10. SR1.1.8.1.1.8.1 The system shall allow the user to specify a feature on the route marking the beginning of the interval containing the object, as described in the Specify Feature On Route requirements. BR-30.11. SR1.1.8.1.1.8.1.3 The system shall automatically populate the geographic location of the object using the beginning of the interval if a milepost is specified and the geographic location of the milepost is available from the GIS database. BR-30.12. SR1.1.8.1.1.8.2 The system shall allow the user to specify a feature on the route marking the end of the interval containing the object, as described in the Specify Feature On Route requirements. BR-30.13. SR1.1.8.1.1.8.2.1 The system shall attempt to populate the geographic location of the object using the ending of the interval only if the geographic location is not available for the beginning of the interval. BR-30.14. SR1.1.8.1.1.8.2.1.3 The system shall automatically populate the geographic location of the object using the ending of the interval if a milepost is specified and the geographic location of the milepost is available from the GIS database. BR-30.15. SR1.1.8.1.1.8.3 The system shall prevent the user from specifying a beginning and ending feature of an interval that are the same feature. BR-30.16. SR1.1.8.1.2.3.4 The system shall pan and/or zoom the map when the Intersecting Feature selection is changed on the Object Location form to include an area around the intersecting feature, if the location of the intersecting feature is known. BR-30.17. SR1.1.8.1.2.3.4.1 The system shall pan and/or zoom the map when the second Intersecting Feature selection is changed on the Object Location form (for a proximity of BETWEEN or FROM-TO) to include an area including both intersecting features, if the location of the intersecting features are known. BR-30.18. The system shall clear the Alias selection if the Milepost is changed. BR-30.19. The system shall update the Location Description to include the milepost information.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
ATMS-2405	BR-31.1. SR1.1.8.1.1.10 The system shall allow the user to specify a textual location description. BR-31.2. SR1.1.8.1.1.10.1 The system shall generate the object location description based on the values specified in the location fields, unless the location description has been overridden by the user. BR-31.3. SR1.1.8.1.1.10.1.1 If no location information is specified, the textual location shall indicate the location is unknown. BR-31.4. SR1.1.8.1.1.10.1.2 If a main route is specified, the textual location shall be the main route, with further identifying information as available. BR-31.5. SR1.1.8.1.1.10.1.2.1 The textual description shall include the route number or name, as specified by the "show name" option for the main route, if it is a known route from the GIS database. BR-31.6. SR1.1.8.1.1.10.1.2.2 The textual description shall include the route description, if the main route was entered as free form text. BR-31.7. SR1.1.8.1.1.10.1.2.3 The textual description based on the main route shall include direction if the user has specified a direction. BR-31.8. SR1.1.8.1.1.10.1.2.4 If the object location is relative to a feature (or features) on the route, the textual description shall include the object's location relative to the feature(s). BR-31.9. SR1.1.8.1.1.10.1.2.4.1 The textual description shall include the proximity of the object to the specified feature(s). BR-31.10. SR1.1.8.1.1.10.1.2.4.1.1 If the object location's proximity is 'FROM-TO', the textual description shall be formatted as: FROM first feature description TO second feature description. BR-31.11. SR1.1.8.1.1.10.1.2.4.1.2 If the object location's proximity is 'BETWEEN', the textual description shall be formatted as: BETWEEN first feature description AND second feature description. BR-31.12. SR1.1.8.1.1.10.1.2.4.2 The textual description shall include a description of the specified feature(s) on the route. BR-31.13. SR1.1.8.1.1.10.1.2.4.2.1 If a feature on the route is an intersecting route, the feature description shall consist of the route number or name, as specified by the show name option for the intersecting route, if it is a known intersecting route from the GIS database.	Traffic Events & Devices	UC-31.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-31.14. SR1.1.8.1.1.10.1.2.4.2.2 If a feature on the route is an intersecting route, the feature description shall consist of the route description, if the intersecting route was entered as free form text. BR-31.15. SR1.1.8.1.1.10.1.2.4.2.3 If a feature on the route is an exit, the feature description shall consist of the exit number (and suffix, if applicable) followed by the name of the road to which the exit leads if a name is available from the GIS Service. BR-31.16. SR1.1.8.1.1.10.1.3 If the object location was specified using a location alias, the system shall append the public name of the alias in parenthesis to the textual description of the location, if the public alias name is not the empty string. BR-31.17. SR1.1.8.1.1.10.1.4 If a main route is not specified, the textual description shall include the county if the user has specified a county. BR-31.18. If a main route is not specified, the textual description shall include the state code appended to the county name if the user has specified both. BR-31.19. SR1.1.8.1.1.10.1.5 If a main route is not specified, the textual description shall include the region if the user has specified a region. BR-31.20. If a main route is not specified, the textual description shall include the state code appended to the region name if the user has specified both and the region name does not end in the state name or state code. BR-31.21. SR1.1.8.1.1.10.1.6 If a main route is not specified, the textual description shall include the state if the user has specified a state. BR-31.22. SR1.1.8.1.1.10.2 The system shall allow the user to override the generated object location description and specify free form text as the location description. BR-31.23. SR1.1.8.1.1.10.2.1 The system shall prompt for confirmation before allowing the user to override the location description, warning the user that overriding the location description is discouraged. BR-31.24. SR1.1.8.1.1.10.2.2 The system shall warn the user again before allowing the overridden location description to be used. BR-31.25. SR1.1.8.1.1.10.3 The system shall require the location description to be specified and contain at least one non-blank character. BR-31.26. The system shall NOT clear the Alias selection if the location description is changed.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
ATMS-2406	BR-32.1. SR1.1.8.1.2.2 The system shall allow the user to specify an object's geographic location by clicking on the map in an appropriate way. BR-32.2. SR1.1.8.1.2.2.1 The system shall use the specified geographic location to perform a GIS query to obtain other location information for the object, if the user has chosen to initiate a new location from the map (and is not just adjusting the coordinates for an existing location). BR-32.3. SR1.1.8.1.2.2.1.1 The system shall look up the U.S. state containing the specified geographic location for the object, if the location is within a state of interest which has a boundary defined in the GIS database. BR-32.4. SR1.1.8.1.2.2.1.1.1 The system shall update the State field in the associated object location form, if the state returned from the GIS query is different than the current selection. BR-32.5. SR1.1.8.1.2.2.1.2 The system shall look up the county within a U.S. state containing the specified geographic location for the object, if the location is within a county of interest which has a boundary defined in the GIS database. BR-32.6. SR1.1.8.1.2.2.1.2.1 The system shall update the County field in the associated object location form, if the county or state returned from the GIS query are different than the current selections. BR-32.7. The system shall populate the Route list based on the County selection and the default Route Type (Interstate), if the location is in MD and roads are available from a GIS service. BR-32.8. SR1.1.8.1.2.2.2 The system shall use the specified geographic location when the object's location information is saved. BR-32.9. SR1.1.8.1.2.2.3 The system shall allow the user to adjust the coordinates of a previously specified location without modifying the data in the other location fields in the form. BR-32.10. SR1.1.8.1.2.2.4 The system shall ask the user whether the coordinates specified via map click are for an adjustment of an existing location, or are for a new location, if the new coordinates are more than a configurable threshold distance from the previous coordinates. BR-32.11. SR1.1.8.1.2.3.4.3 The system shall ask the user whether to replace the previous coordinates, if the previous coordinates were specified by the user and the new location is more than a configurable threshold distance from the old location.	Traffic Events & Devices	UC-32.0	DD 4.4

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-32.12. SR1.1.8.1.2.4 The system shall display a map that can be used when specifying an object's location. BR-32.13. SR1.1.8.1.2.5 The system shall allow the user to zoom in or out when using the map to specify an object location. BR-32.14. SR1.1.8.1.2.6 The system shall allow the user to pan the map when using a map to specify an object's location. BR-32.15. SR1.1.8.1.2.7 The system shall display a marker at the coordinates to indicate the currently specified location. The location of this marker will be updated as necessary to reflect changes in the specified location. BR-32.16. The system shall track the source of the coordinates (i.e., the name of the user, or GIS data if coordinates were derived from an intersecting feature GIS data). BR-32.17. The system shall allow the user to enter the Latitude / Longitude coordinates via text entry, for objects other than traffic events. BR-32.18. The system shall prevent the user from manually entering a Latitude value that is outside a configurable valid value range. BR-32.19. The system shall prevent the user from manually entering a Longitude value that is outside a configurable valid value range. BR-32.20. The system shall NOT clear the Alias selection if the coordinates are adjusted. BR-32.21. The system shall allow the coordinates to be cleared from the map. BR-32.22. SR4.2.1.6.12.5 The system shall allow the user to initiate the opening of a new traffic event by choosing a Traffic Signal on the map to specify the location of the traffic event. (Used primarily for Action Events.) BR-32.23. The system shall clear the associated signal if any location fields are changed (except description). BR-32.24. The system shall revert the location description to not be overridden if the associated signal is cleared.			
ATMS-2412	BR-35.1. SR4.2.1.6.5 The system shall allow the user to specify the vehicle Color/Make for the new event. BR-35.2. SR4.2.1.6.6 The system shall allow the user to specify the vehicle Tag Information for the new event. BR-35.3. SR4.2.2.5.2.1 The system shall allow a user with the Manage Traffic Events right to specify a source type for a traffic event, including the special type of "Field	Traffic Events	UC-35.0	DD 4.5

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	Unit". BR-35.4. The list of source types shall include Field Unit. BR-35.5. The list of source types shall include CCTV. BR-35.6. The list of source types shall include Citizen. BR-35.7. The list of source types shall include LCP. BR-35.8. The list of source types shall include Local Police. BR-35.9. The list of source types shall include Montgomery County TMC. BR-35.10. The list of source types shall include MDTA. BR-35.11. The list of source types shall include Media. BR-35.12. The list of source types shall include SHA. BR-35.13. The list of source types shall include State Police. BR-35.14. The list of source types shall include System Alarm. BR-35.15. The list of source types shall include other. BR-35.16. SR4.2.2.5.2.2 The system shall allow a user with the Manage Traffic Events right to specify a source name if the source type is not "Field Unit". BR-35.17. SR4.2.2.5.2.3 The system shall allow a user with the Manage Traffic Events right to specify a unit name (of an event resource with a unit name) as the source for a traffic event when the special source type of "Field Unit" is used. BR-35.18. The system shall allow the user to select U.S. state for specifying Tag Information of a disabled vehicle. BR-35.19. The system shall default the state selection to MARYLAND. BR-35.20. The system shall display the commonly used states on top of the list as requested by the client. BR-35.21. SR4.2.2.7.4 The system shall allow a suitably privileged user to specify the attributes for an Incident. BR-35.22. SR4.2.2.7.4.1 The system shall allow the user to specify the Incident Type. BR-35.23. SR4.2.2.7.4.1.1 The list of incident types shall include Disabled in Roadway. BR-35.24. SR4.2.2.7.4.1.2 The list of incident types shall include Collision Personal Injury. BR-35.25. SR4.2.2.7.4.1.3 The list of incident types shall include Collision Property Damage.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-35.26. SR4.2.2.7.4.1.4 The list of incident types shall include Collision Fatality. BR-35.27. SR4.2.2.7.4.1.5 The list of incident types shall include Debris in Roadway. BR-35.28. SR4.2.2.7.4.1.6 The list of incident types shall include Emergency Roadwork. BR-35.29. SR4.2.2.7.4.1.7 The list of incident types shall include Vehicle Fire. BR-35.30. SR4.2.2.7.4.1.8 The list of incident types shall include Police Activity BR-35.31. SR4.2.2.7.4.1.9 The list of incident types shall include Off-Road Activity. BR-35.32. SR4.2.2.7.4.1.10 The list of incident types shall include Other. BR-35.33. SR4.2.2.7.4.1.11 The list of incident types shall include Utility Problem. BR-35.34. SR4.2.2.7.4.1.12 The list of incident types shall include Weather Closure. BR-35.35. SR4.2.2.7.4.1.13 The list of incident types shall include Weather Closure, High Water. BR-35.36. SR4.2.2.7.4.1.14 The list of incident types shall include Weather Closure, Winter Precip. BR-35.37. SR4.2.2.7.4.1.15 The list of incident types shall include Weather Closure, Debris. BR-35.38. SR4.2.2.7.4.1.16 The list of incident types shall include Weather Closure, Utility. BR-35.39. SR4.2.2.7.4.1.17 The list of incident types shall include Medical Emergency. BR-35.40. The system shall allow the user to confirm the event while creating a new event. BR-35.41. The system shall allow the user to reset the create event form.			
ATMS-2419	BR-41.1. The Flex-based audio recorder shall be removed from the system. BR-41.2 SR4.2.3.3.2.2.6.5.6 The system shall allow the user to upload a previously recorded audio file. (Modified for R18; was: "The system shall allow the user to choose between using the integrated recording control and uploading a previously recorded audio file.")	HAR		DD 4.6
ATMS-2601	BR-51.1 The system shall allow a specific DMS to be configured to skip the Font Status check when putting that DMS online or maintenance mode. BR-51.2 The system shall perform the font status check, by default.	DMS	UC-51.0	DD 4.9

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
ATMS-2523	BR-52.1. The system shall support configuring a monitor as an RVDS monitor. BR-52.2. The system shall support specifying the MAC address of an RVDS Video Streaming Device to use for an RVDS monitor. BR-52.3. The system shall support specifying the virtual monitor number of an RVDS monitor. (For instance, if the physical monitor is split into a "quad" of four virtual monitors, the numbers would range from 1 to 4.) BR-52.4. The system shall support specifying the IP address of the RVDS Video Streamer Service to use for an RVDS monitor. BR-52.5. The system shall support specifying the TCP port of the RVDS Video Streamer Service to use for an RVDS monitor. BR-52.6. The system shall support specifying a prioritized list of Streaming Servers (SFSs) to be used to attempt to find a video stream for cameras to be displayed on an RVDS monitor. BR-52.7. The system shall support putting a video on an RVDS monitor from the Monitor Details Page or Monitor List. BR-52.8. The system shall support removing video from an RVDS monitor from the Monitor Details Page or Monitor List. BR-52.9. The system shall support putting a video on an RVDS monitor from a Camera Details Page or Camera List. BR-52.10.The system shall support removing a video from an RVDS monitor from the Camera Details Page or Camera List. BR-52.11.The system shall support running a tour on an RVDS monitor from the Monitor Details Page or Monitor List. BR-52.12.The system shall support stopping a tour on an RVDS monitor from the Monitor Details Page or Monitor List. BR-52.13.The system shall support running a tour on an RVDS monitor from the tour. BR-52.14.The system shall support stopping a tour on an RVDS monitor from the tour.	Monitors	UC-52.0	VideoControlIDLClasses CameraControlIDLClasses DD 3.1.1.1.2

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-52.15.The system shall stop display of a camera on an RVDS monitor when the monitor is taken offline. BR-52.16.The system shall stop display of a camera on an RVDS monitor displaying that camera when an operator takes that camera offline. BR-52.17.The system shall stop display of a camera on an RVDS monitor configured as public that is displaying that camera, when that camera is blocked to public. BR-52.18.The system shall stop display of a camera on an RVDS monitor configured as public that is displaying that camera, when an operator controls that camera. (Controlling a camera automatically blocks the camera to public.) BR-52.19.The system shall support configuring an RVDS monitor as an auto mode monitor. BR-52.20.The system shall play cameras in a tour that are added to an RVDS auto mode monitor via one or more traffic event(s) on that RVDS monitor. BR-52.21.The system shall remove a camera (or multiple cameras) removed from an RVDS auto mode monitor via a traffic event from the auto mode tour playing on that monitor. The system shall support configuring an RVDS monitor configured as auto mode to NOT be an auto mode monitor.			
ATMS-2751	BR-53.1 SR3.6.9.4.2.1 The system shall allow a user to play video within a video session if the video was previously paused or not already playing. BR-53.2 SR3.6.9.4.2.1.1 The system shall resume video playback as close to the current time as possible, if the video was previously paused. BR-53.3 SR3.6.9.4.2.2 The system shall allow a user to pause video within a video session, if not already paused. BR-53.4 SR3.6.9.4.2.2.1 The system shall pause the switching of video sources when a desktop tour is paused, so that the image that was displayed at the time of pausing remains displayed. BR-53.5 SR3.6.9.3.2 The system shall allow the user to select a preconfigured video tour for display on the desktop.	Video	UC-53	DD 4.11 DD 5.2.1.2.6 DD 5211

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	BR-53.6 SR3.6.9.3.2.2 The system shall ignore any camera presets defined in the tour when displaying on the desktop. (NOTE - this is to avoid issues that could arise from too many desktop tours trying to command the camera). BR-53.7 SR3.6.9.3.2.2.1 The system shall indicate to the user that presets will be ignored when playing the preconfigured video tour on the desktop. BR-53.8 SR3.6.9.3.2.4 The system shall display the name of the preconfigured tour when displaying the tour in a desktop video session. BR-53.9 SR3.6.1.4.1 The system shall allow a camera to be controlled only if the camera image is displayed on a local monitor or in a video session on the user's desktop. BR-53.10 SR3.6.1.4.1.2 The system shall automatically open a desktop video session when a user requests (or overrides) control, if the camera is not already displayed on a local monitor or on the user's desktop, if the user has the View Desktop Video right and the camera is eligible for desktop video display. BR-53.11 SR3.6.1.4.1.2.1 The system shall automatically play the video, if it automatically acquired a video session to ensure that the user has the camera displayed locally. BR-53.12 SR3.6.1.4.1.3 The system shall allow an operator controlling a camera to close a desktop video session (without closing the control session) only if the camera is displayed on a local monitor. BR-53.13 SR3.6.1.4.17.2 The system shall allow a camera's control to be overridden only if the camera image is displayed on a local monitor or in a video session on the user's desktop. BR-53.14 SR3.6.9.4.2.5 The system shall end (or release) the video session resource after the user closes the window that is displaying the corresponding video (or closes the desktop video portion of the camera control window). BR-53.15 SR3.6.9.4.2.7 The system shall stop playing video in a video session if the session was canceled by another user.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	3R-53.16 SR3.6.9.4.2.7.1 The system shall display a message to the user explaining why the video was stopped, if the user's video session was canceled by another user. 3R-53.17 SR3.6.9.4.3 The system shall allow the user to have multiple desktop video sessions playing simultaneously on the same computer. 3R-53.18 SR3.6.9.2.1 The system shall allow a user to display a streaming camera image on his or her desktop monitor, if a Streaming Flash Server is configured for the camera that matches the GUI's designated Streaming Flash Server, subject to restrictions listed in sub-requirements.\ 3R-53.19 SR3.6.9.2.1.2 The system shall allow desktop video to be displayed only if the camera is online. 3R-53.20 SR3.6.9.2.1.3 The system shall allow desktop video to be displayed only if the camera is not blocked for the organization assigned to the operations center at which the user is logged in. 3R-53.21 SR3.6.9.2.1.4 The system shall allow desktop video to be displayed only if the camera is not blocked to the GUI's designated Streaming Flash Server. 3R-53.22 SR3.6.9.2.1.7 The system shall indicate when a video source is no longer eligible for display on the desktop (e.g., blocked for the user's op center's organization, blocked to the GUI's designated Streaming Flash Server, or if the camera goes offline). 3R-53.23 SR3.6.9.3.3 The system shall stop displaying a camera in a desktop video tour if the camera becomes ineligible for display after the tour is already running. 3R-53.24 SR3.6.9.3.4 The system shall include a camera in a desktop video tour if the camera becomes eligible for display after the tour is already running. 3R-53.25 SR3.6.9.3.7 The system shall indicate if all video sources in the tour become ineligible to be displayed on the desktop. 3R-53.26 The camera shall display NVA screen with “Buffering timeout			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	error", if buffering takes too long. 3R-53.27 SR1.5.7.3.18 The system shall show the status for each Streaming Flash Server configured for a camera. 3R-53.28 SR1.5.7.3.18.3 The system shall show whether the camera is currently blocked for the Streaming Flash Server or not. 3R-53.29 SR3.6.1.1.3.2 The system shall prevent flash video streaming if a camera image has been blocked from public viewing, for any Streaming Flash Servers configured for the camera that are designated as "public". 3R-53.30 SR3.6.1.1.4.1 The system shall automatically enable flash video streaming as a camera image is unblocked from public viewing for all Streaming Flash Servers configured for the camera that are designated as "public". 3R-53.31 SR3.6.3.9.1 The system shall allow a suitably privileged operator to revoke a camera image from monitors and desktop video sessions. 3R-53.32 SR3.6.3.13.2.1 The system shall automatically stop flash video streaming when a camera image is removed from public viewing for any Streaming Flash Servers configured for the camera that are designated as "public". 3R-53.33 SR3.6.3.13.3 The system shall allow a user with the Block Display To Web And Media right to block (stop and prevent) the display of a camera to a specified Streaming Flash Server that is configured for the camera. 3R-53.34 SR3.6.3.13.3.1 The system shall allow a user with the Block Display To Web And Media right to unblock the display of a camera to a specified Streaming Flash Server that is configured for the camera. 3R-53.35 SR3.6.9.4.2.3 The system shall allow the user to resize the video image that is displayed in a video session. 3R-53.36 SR3.6.9.4.2.3.1 The system shall allow the user to display the video in full-screen mode within a video session. 3R-53.37 SR3.6.9.4.2.3.1.1 The system shall use only one monitor head when displaying full-screen video on a computer with more than one monitor.			

PR	Requirement	Features	Use Case	Other Design Elements (DD refers to a Section in this Design Document)
	3R-53.38 SR3.6.9.4.2.3.1.2 The system shall allow the user to exit full-screen mode when displaying full-screen video. 3R-53.39 SR3.6.9.4.2.3.1.2.1 The system shall cause the video to be displayed at the size that was used prior to invoking full-screen mode, when exiting full screen mode. 3R-53.40 SR3.6.9.2.2 The system shall display the name of the video source for the desktop video. SR3.6.9.2.3 The system shall display a description of the location of the video source for the desktop video.			